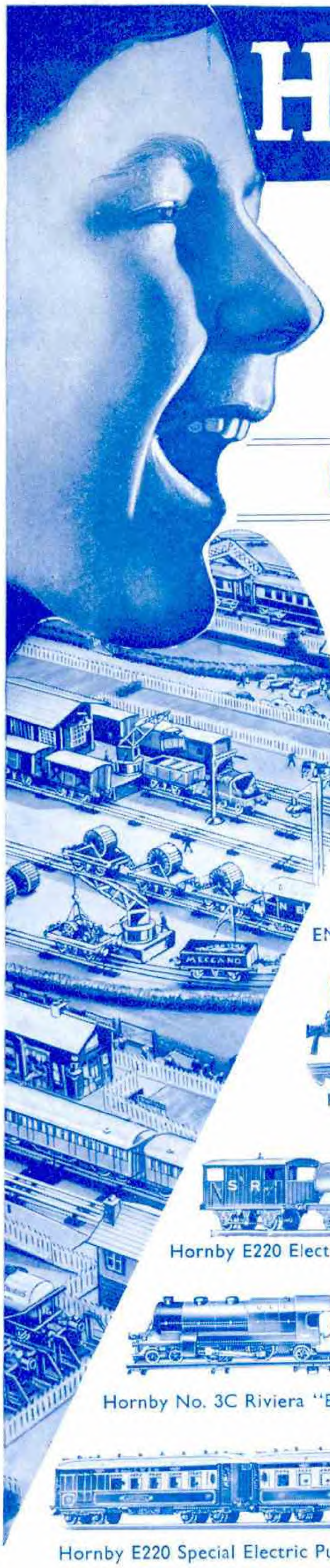
MECCANO MAGAZINE

VOL. XXI · No. 5

MAY 1936

PRICE 6d

MAGNETS IN INDUSTRY
(see page 250)



HORNBY TRAINS

BRITISH AND GUARANTEED

Real and Lasting Fun

The splendid fun of running a Hornby Railway is real and lasting, because of the exceptional strength and reliability of Hornby Locomotives, both Electric and Clockwork, the realistic appearance and easy running of the Rolling Stock, and the wide range of effective Accessories.

From the day of their introduction Hornby Trains have always represented the latest model railway practice. Designs are continually being improved and new items added so that the system is complete in practically every detail.

Ask your dealer for a copy of the latest Hornby Train price list.

PRODUCT of MECCANO LIMITED LIVERPOOL

Boys! Run your own model railway

A SELECTION FROM THE RANGE OF HORNBY ELECTRIC and CLOCKWORK TRAINS



M1 Clockwork Passenger Train Set (reversing). Price **8/11**



EM320 (20-volt) or EM36 (6-volt) Electric Tank Goods Train Set (reversing). Price **24**/-



Hornby No. 1 Clockwork Passenger Train Set (reversing). Price **25**/-



Hornby E220 Electric Mixed Goods Train Set (20-volt, automatic reversing). Price **47/6**

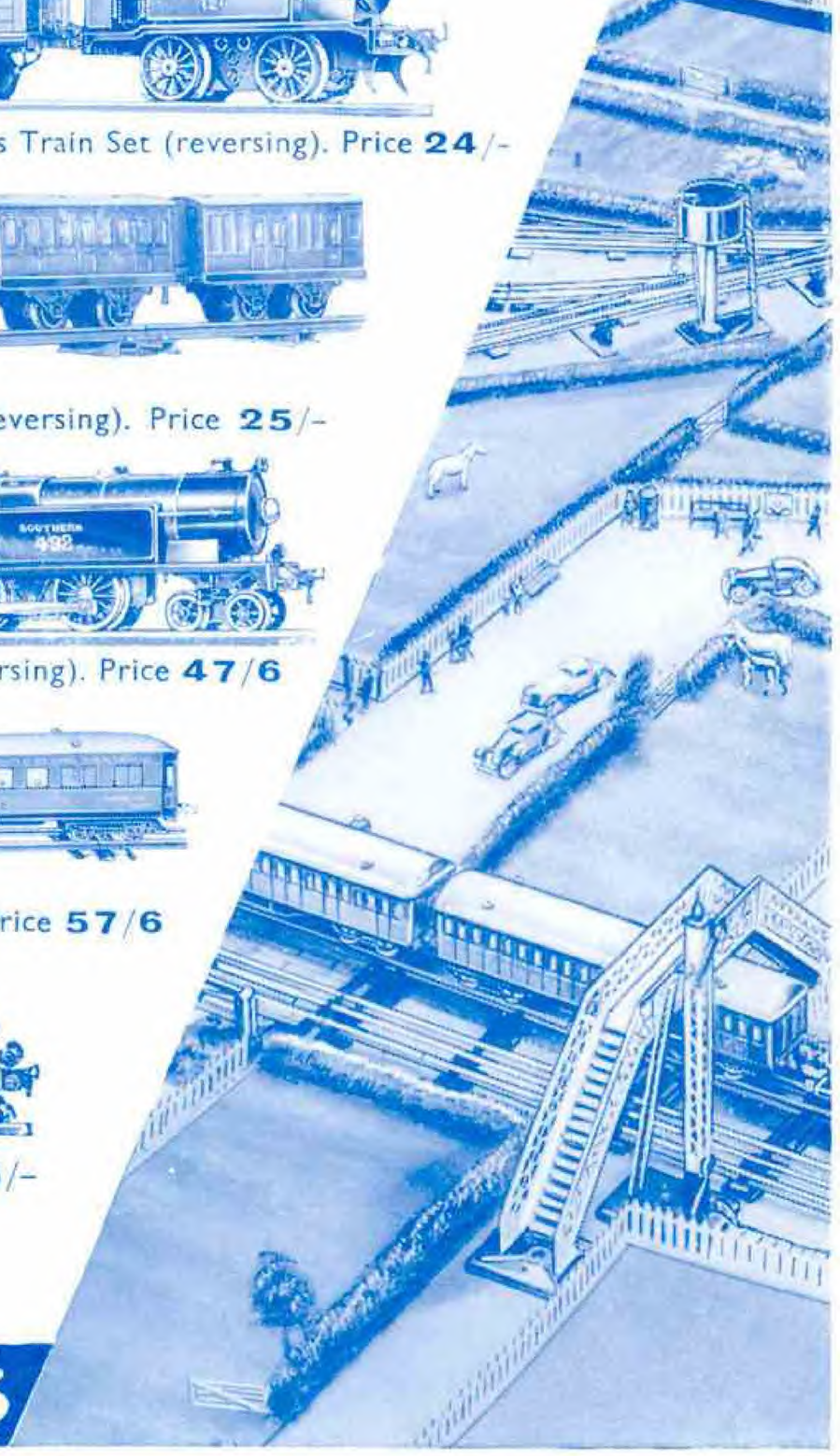


Hornby No. 3C Riviera "Blue" Clockwork Passenger Train Set (reversing). Price **57/6**



Hornby E220 Special Electric Pullman Set (20-Volt, automatic reversing). Price **75**/-

Prices of Hornby Electric Trains Sets from 15/- to 75/-
Prices of Hornby Clockwork Trains Sets from 4/11 to 65/-



MECCANO LTD., LIVERPOOL 13

EXTRA SPECIAL EDITION

DISPLAY OF LATEST TYPE MONOPLANES

Hamley's News

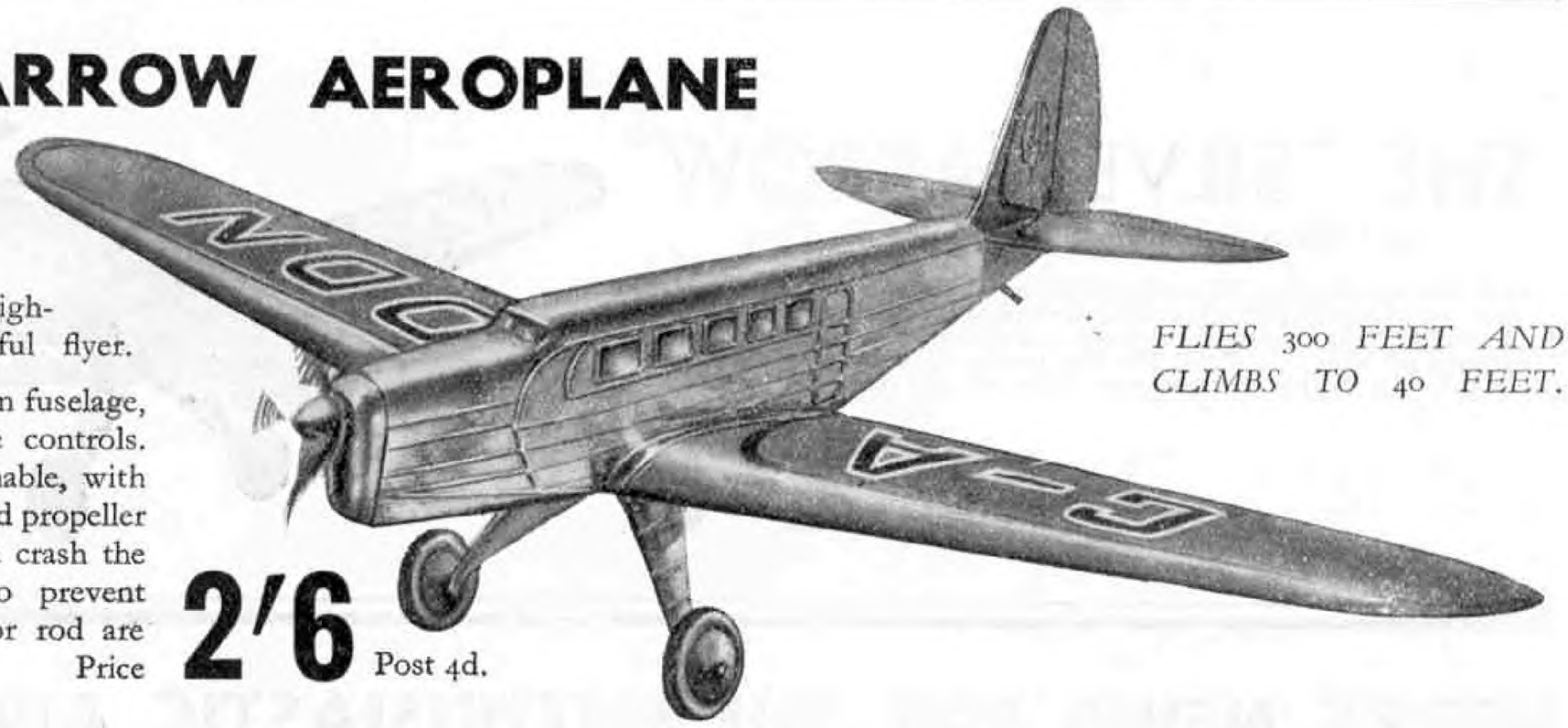
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EQUIPMENT FOR SCIENTISTS AND PHOTOGRAPHERS

No. 36 *May, 1936*

THE SILVER ARROW AEROPLANE



This lovely low-wing cabin monoplane really does look the part. It's an exact replica of the latest type high-speed transport, and is a beautiful flyer.

The "Silver Arrow" has an aluminium fuselage, transparent windows and adjustable controls. Wings are double-surface and detachable, with a span of 16½ ins. An accurately pitched propeller gives fine range and speed, and in a crash the propeller and nose-piece detach to prevent damage. A spare motor and insertor rod are included.

FLIES 300 FEET AND CLIMBS TO 40 FEET.

Price **2/6** Post 4d.



THE NEW KODAK CAMERA

This new Kodak is a first class camera in miniature and gives wonderful pictures with the aid of an instantaneous shutter and the standard vest pocket 8-exposure roll film. The case is black bakelite.

Film 1/– extra Price **5/-**

Carrying Case 1/– Post 4d.

THE STUDENT MICROSCOPE OUTFIT

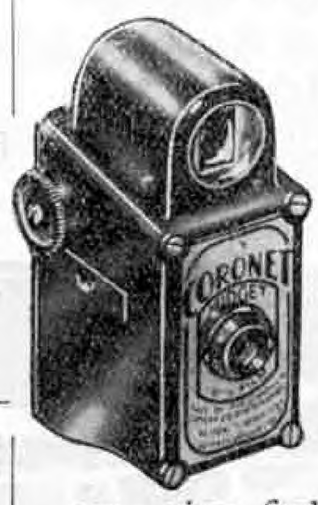


Do you like biology and botany? You'll be amazed at what you can see in this high-power microscope.

40 x linear magnification with magnifier, dissecting needles, tweezers and collection jar. (Foreign.)

Price **5/-** Post 6d.

CORONET MIDGET CAMERA



Keep mementos of the things you like: snap them with this natty little camera. The case is in walnut, green, blue, rose and black. F 10 lens, shutter working 1/30 sec., view finder. Takes perfect pictures.

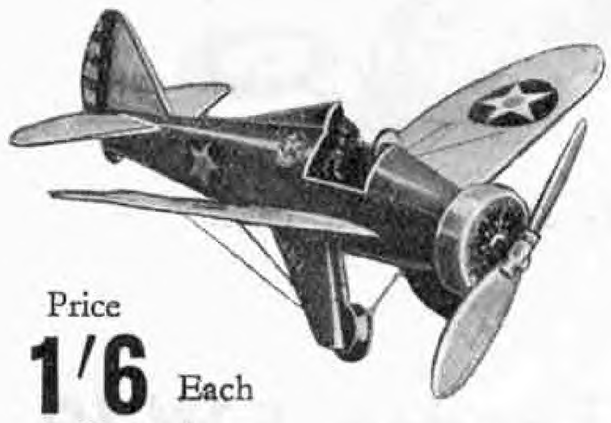
Leather Case **1/3.** Price **5/6**

Film **6d.** Post 3d.

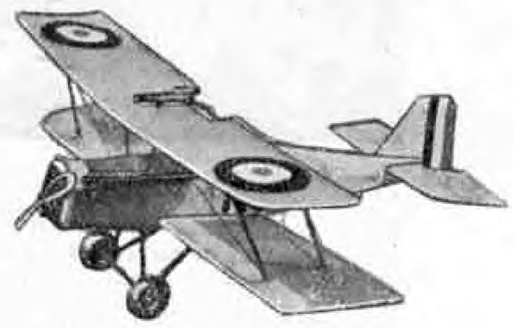
FLYING MODEL CONSTRUCTION SETS

Join the Lindberg Flying Squadron and make your own aeroplane. You can build scale models of S.E.5, Curtiss Goshawk, Boeing P.26A., U.S. Navy Racer and Monocoupe. The wing span is 13 ins. Each kit comprises balsa strips cut to correct size, curved parts clearly printed on balsa, full working plan, cement, wire, tissue, finished wheels, etc. (Foreign.)





Price **1/6** Each Post 3d.



NEW MODELS NOW IN STOCK.

Macchi, Sopwith Camel, Chester Racer, Boeing F.4.B.4, Super Fury.

FROG MODEL AIRCRAFT

FROG TRADE MARK REGD.

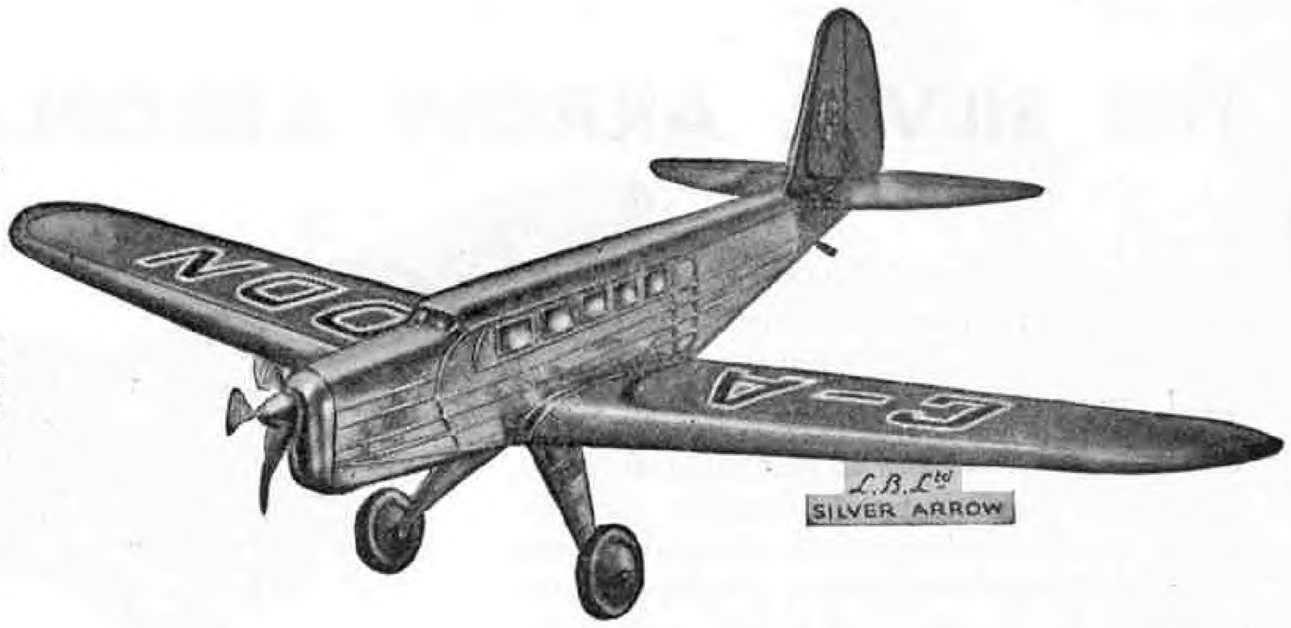
Learn the science of flying for only half-a-crown

THE "SILVER ARROW"

Low Wing Monoplane Single Engine Air Liner

Read the specification: Aluminium fuselage; detachable propeller and nose piece; accurate pitch propeller; adjustable controls; transparent windows; wing span 16½ ins.; spare motor and insertor rod; double-surface detachable wings. Flies 100 to 120 ft. To obtain the best results lubricate your elastic motor regularly with Frog Motor Lubricant. Price 2d. per bottle.

Price only **2'6**



HERE'S NEWS FOR THE ENTHUSIASTIC AIRCRAFTSMAN!

Three new low priced **CONSTRUCTION KITS** for BUILDING FLYING SCALE MODELS of:—

De Havilland "LEOPARD MOTH" ... ... **2'6**
Wing Span 12¼ in. Length 9½ in.

De Havilland "HORNET MOTH" ... ... **3'6**
Wing Span 11 in. Length 9½ in.

Hawker "DEMON" 2-seater Fighter ... ... **4'6**
Wing Span 12¼ in. Length 11 in.

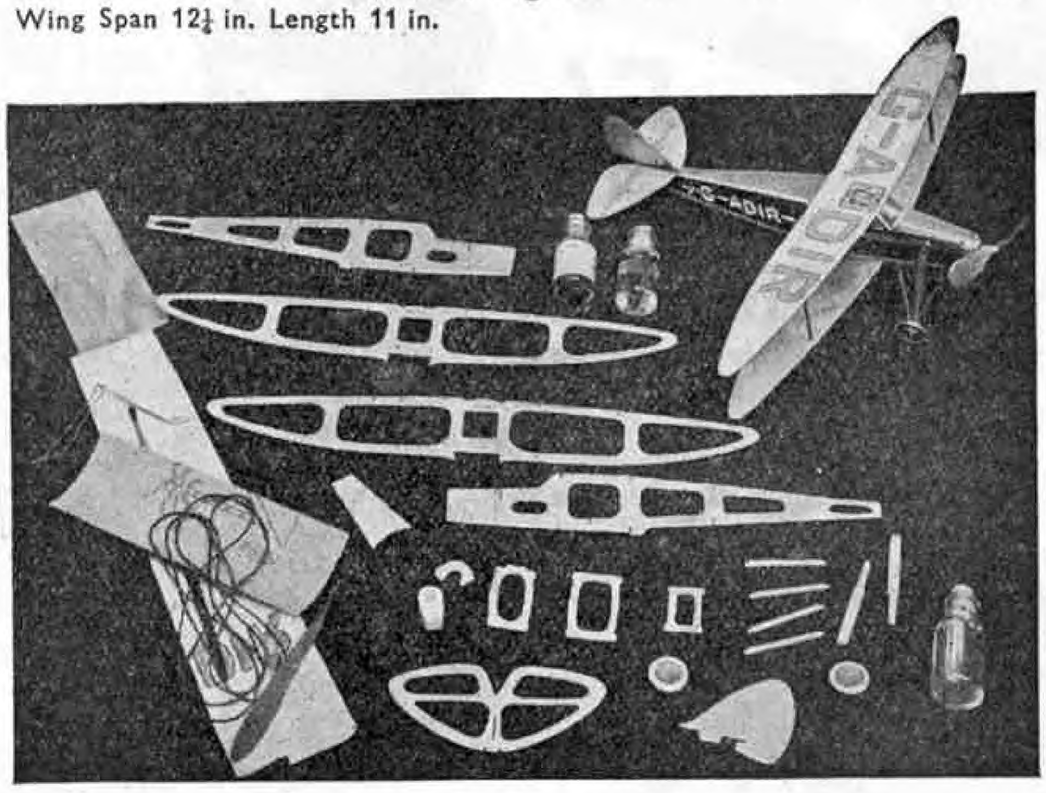
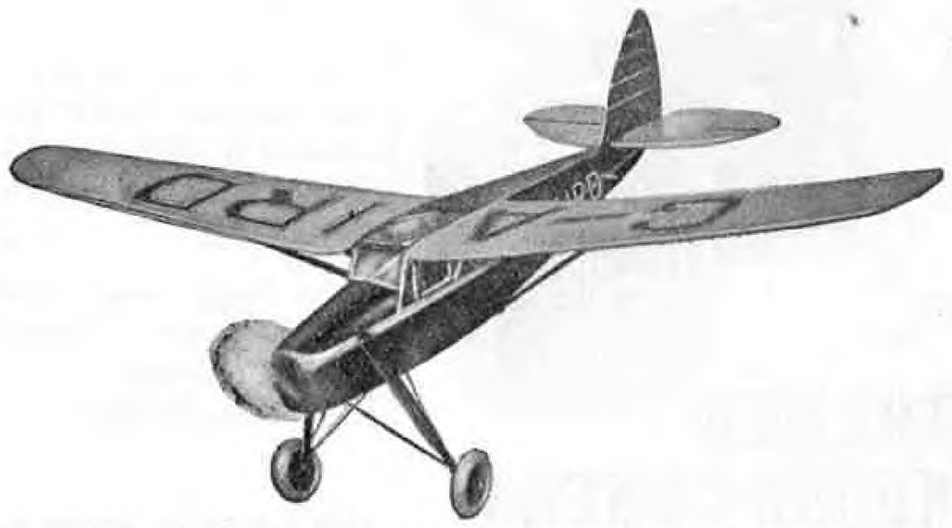
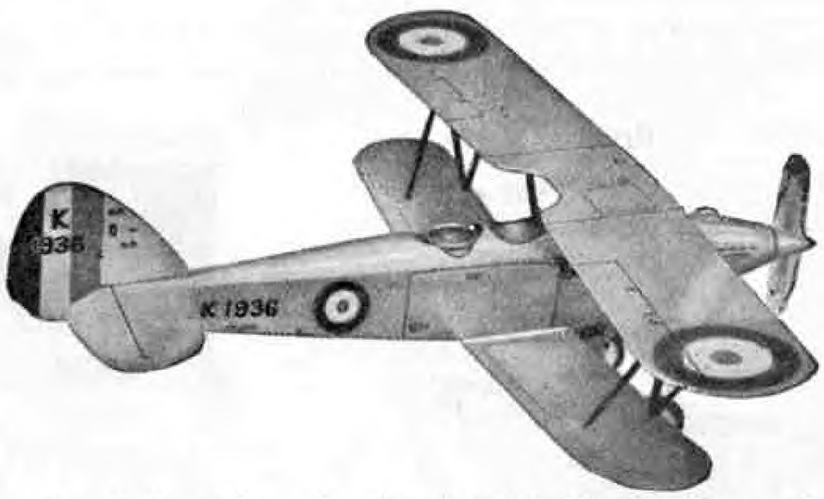


Photo of completed De Havilland "Hornet Moth"; also construction kit.

These construction kits enable the enthusiast to build his own Flying Scale Models. They are easy to build and no tools are required. All parts are blanked out and fit together perfectly, only needing to be glued. (This is supplied.) Wire parts are already bent to shape. No paint is required, all coverings are printed in the correct colours. Supplied complete with motor lubricant and spare motor.



Actual photo of completed model of De Havilland "Leopard Moth."



Actual photo of completed model of the Hawker "Demon."

Designed and made by International Model Aircraft Ltd. Sole concessionaires:

LINES BROS. Ltd., Tri-ang Works, Morden Rd., London, S.W.19

TOYS OF QUALITY MADE BY

MECCANO LTD.



BOYS! YOU MUST HAVE THIS FINE MODEL OF THE "QUEEN MARY"



A SOUVENIR OF A GREAT ACHIEVEMENT

Every boy should have one of these fine Dinky Toys miniatures to keep as a souvenir of the wonder ship "Queen Mary," the most magnificent liner yet built. The model is a splendid reproduction of the giant vessel on a scale of 1 in. to 150 ft., and it emphasises the graceful lines that make her the stateliest ship in the world. All external details, from the great wheelhouse and bridge to the motor lifeboats and the ventilators, are faithfully reproduced.

The miniature is beautifully finished in correct Cunard White Star colours.

The illustration above reproduces the exact size of the Dinky Toys model of the "Queen Mary."

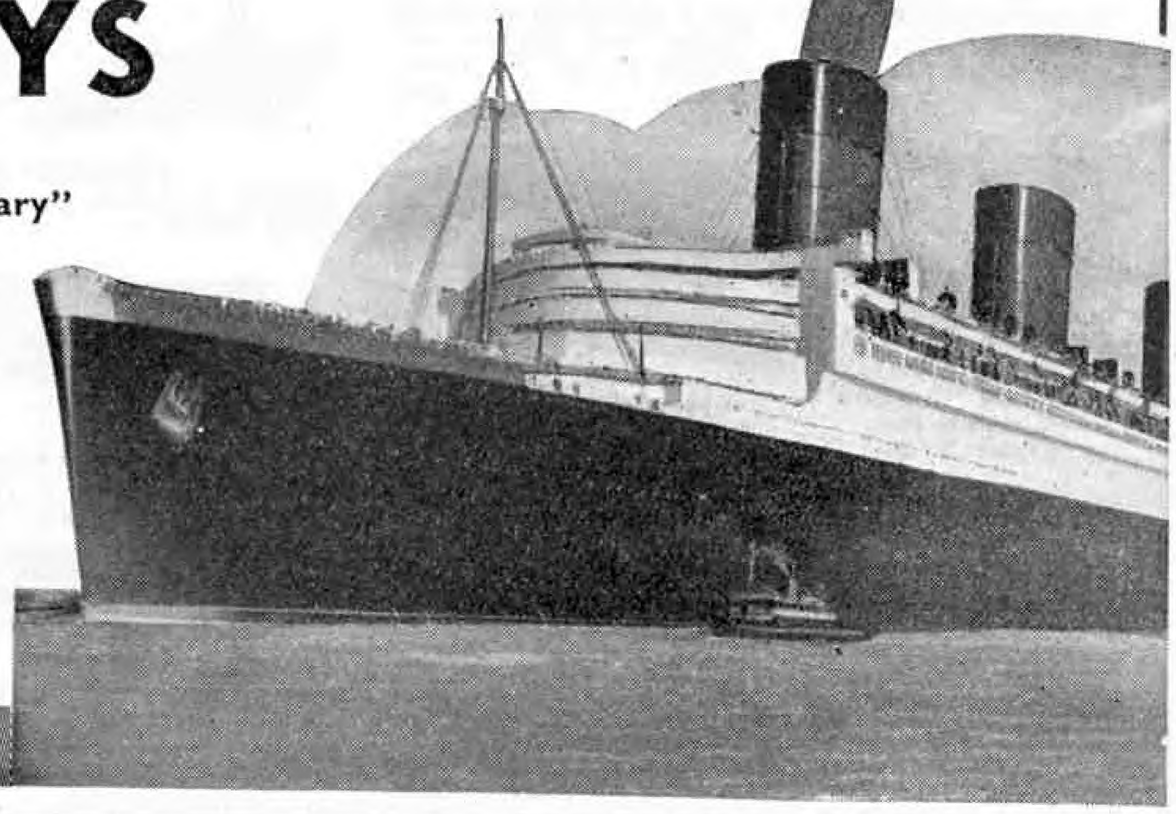
DINKY TOYS

No. 52A

Cunard White Star Liner "Queen Mary"

Price **1/-**

GET THIS SPLENDID DINKY TOYS MODEL FROM YOUR DEALER TO-DAY.



PRODUCT of MECCANO LIMITED LIVERPOOL

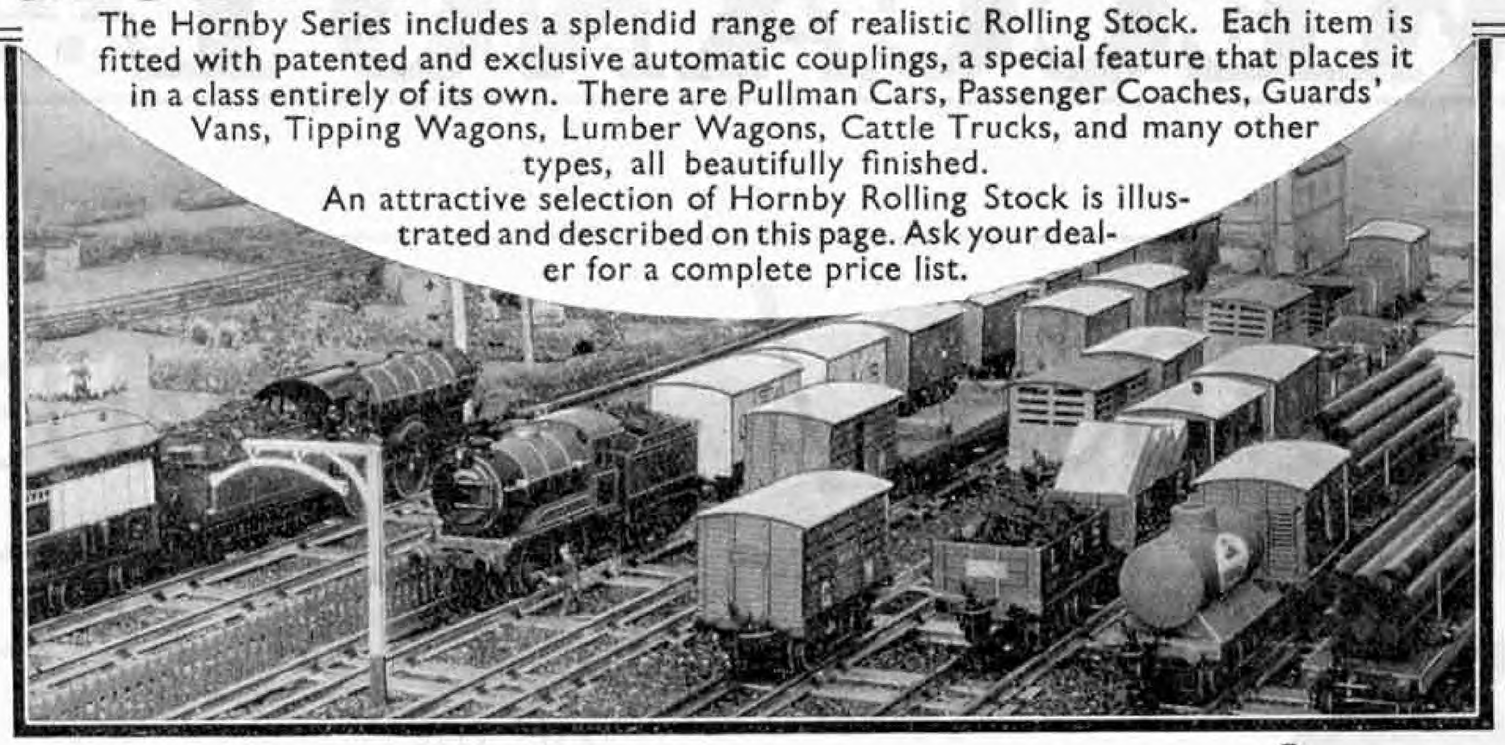
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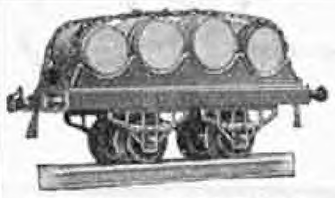
HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE O

The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, Cattle Trucks, and many other types, all beautifully finished.
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.





BARREL WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **2/6**



MEAT VAN
A very realistic model. Available lettered L.M.S. only. Price **1/9**



No. O ROTARY TIPPING WAGON
Price **1/6**



No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/-**



No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/6**



***GUNPOWDER VAN**
Finished in red. With opening doors. Price **2/9**



BITUMEN TANK WAGON "COLAS"
Finished in blue.
Price **3/6**



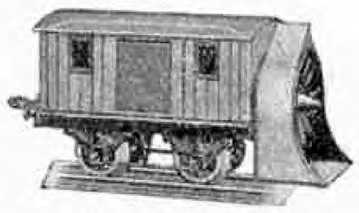
No. O MILK TRAFFIC VAN
An attractive model Available lettered G.W. only Price **1/9**



No. 1 BANANA VAN "FYFFES"
An attractive model, finished in yellow and red. Price **2/9**



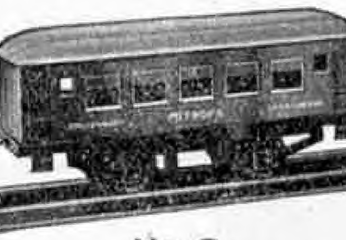
WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**



SNOW PLOUGH
With revolving plough.
Price **3/9**

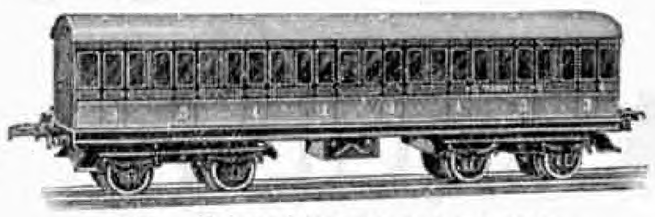


No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **1/6**

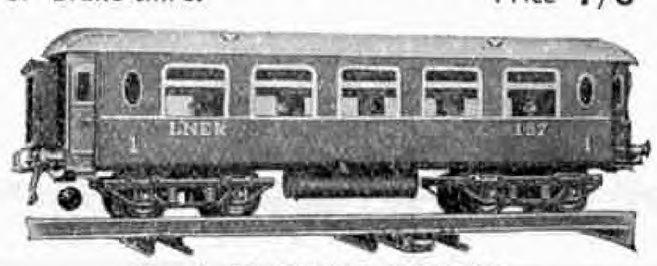


COAL WAGON
Fitted with embossed representation of coal. Price **2/3**

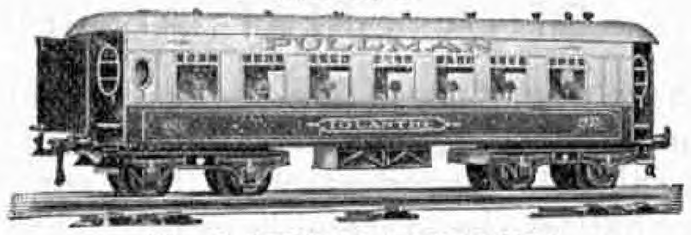
No. O "MITROPA" COACH
Finished in red with white roof. Lettered "Mitropa," with either "Speisewagen" or "Schlafwagen" in gold.
Price **1/6**



***No. 2 PASSENGER COACH**
Suitable for 2 ft. radius rails only. First-third, or Brake-third. Price **7/6**



No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.N.E.R. (as illustrated) enamelled brown, and L.M.S. enamelled maroon. Suitable for 2-ft. radius rails only.
Price **9/6**



No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **13/-**



TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **3/9**



No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**



No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price **2/11**

In L.M.S., L.N.E.R., G.W. or S.R. lettering.



OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/-**



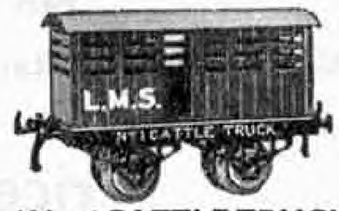
COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. Lettered "Nord."
Price **2/6**



***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors.
Price **2/9**



No. 1 CRANE TRUCK
Finished in brown and blue. Price **2/11**



***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design.
Price **2/9**



FISH VAN
This is a distinctive model. Available lettered N.E. only.
Price **1/9**



MO ROTARY TIPPING WAGON
Container revolves and tips at any angle.
Price **1/-**

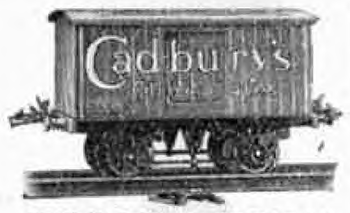


GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**

***OPEN WAGON "B"**
Fitted with centre tarpaulin supporting rail.
Price **2/-**



No. 1 ROTARY TIPPING WAGON
Finished in orange.
Price **2/6**



CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof. Price **2/9**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**



MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white.
Price **4/6**



CEMENT WAGON
The door at the top opens. Finished in bright red.
Price **2/6**

FROG SCALE MODELS

TRADE MARK REGD.

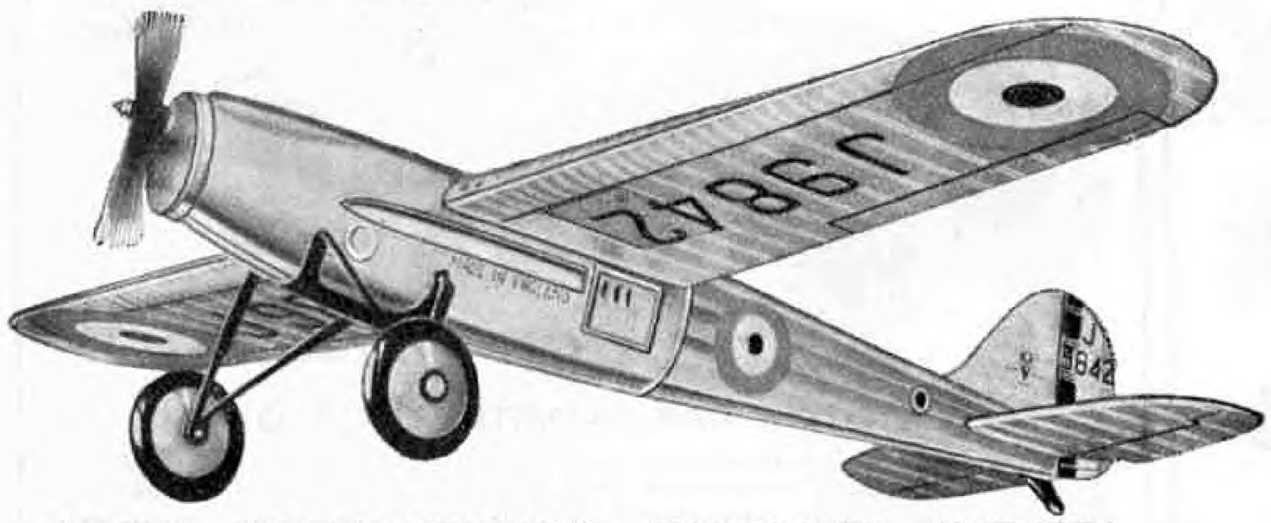
To-day's FROG owners are to-morrow's pilots



FROG PUSS MOTH MONOPLANE

A handsome flying scale-model of the famous De Havilland light aeroplane in which many records have been broken. Wing span—18½ in. Length—13½ in. Complete with Patent High-Speed Winder-Box, Spare Motors, Dual Insertor Rod, Motor Lubricant, Gear-Box Oil and fully illustrated Instruction Manual. Flights of 600 ft. can be obtained under favourable conditions.

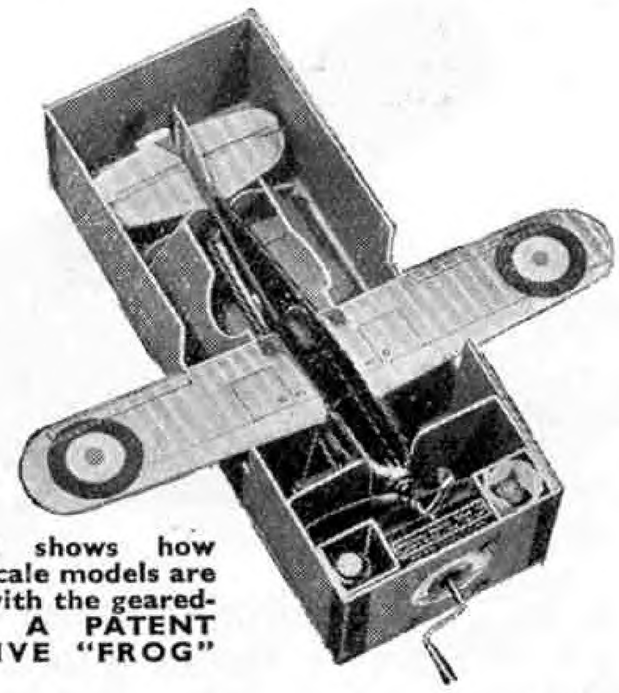
17/6



FROG INTERCEPTOR FIGHTER MK.IV

The original and now famous flying scale-model Interceptor Fighter. Wing Span—11½ in. Duralumin Fuselage. Complete with Patent High-Speed Winder-Box, Spare Motors, Insertor Rod, Motor Lubricant, Gear-Box Oil and fully illustrated Instruction Manual. With practice it will fly 300 ft.

Now only **5/-**



This illustration shows how quickly the Frog scale models are wound for flight with the geared-up Winder-Box. A PATENT AND EXCLUSIVE "FROG" FEATURE.

Frog scale model aircraft Designed and made by International Model Aircraft Ltd. Patented throughout the world. Sole concessionaires:

LINES BROS. LTD., Tri-ang Works
Morden Rd., Merton, London, S.W.19

FREE FLIGHT INSTRUCTION

Lines Bros. will give free flight instructions by appointment on the Frog Aerodrome at Merton. Telephone: Liberty 1041.

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19.

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force pilot badges.

Name.....

Address.....

Please write in block letters.

5/36

TOYS OF QUALITY MADE BY MECCANO LTD.

AEROPLANE CONSTRUCTOR OUTFITS

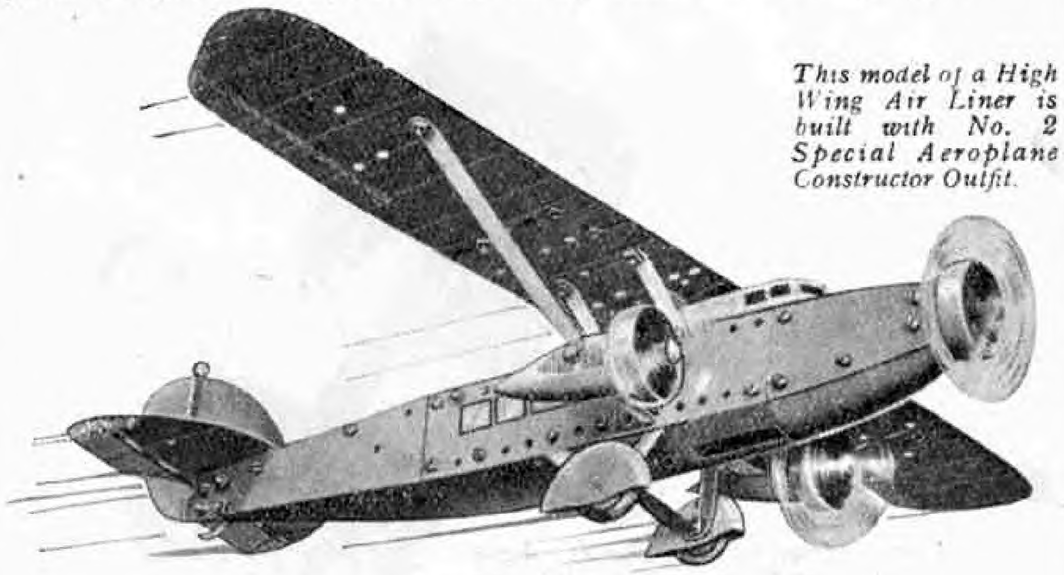


BOYS-BUILD YOUR OWN MODEL AIRCRAFT

No 2 Aeroplane Outfit. Price **12/6**

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise the different types of machines at a glance. These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

The illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting types.



This model of a High Wing Air Liner is built with No. 2 Special Aeroplane Constructor Outfit.

Price List of Aeroplane Outfits

Standard Series.

No. OO Outfit	3/3	No. 1 Outfit	7/6
No. O Outfit	4/6	No. 2 Outfit	12/6

Special Series.

No. 1 Special Outfit	12/6
No. 2 Special Outfit	21/-

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.



AEROPLANE HANGARS

No. O1 AEROPLANE HANGAR will accommodate one model made with the No. OO or No. O Outfits. Length 11⅛ in. Depth 10¼ in. Height 4¼ in. Price **4/6**

No. O2 AEROPLANE HANGAR will accommodate two models made with the No. O or No. OO Outfits. Length 21⅛ in. Depth 11 in. Height 6¼ in. Price **5/11**

MOTOR CAR CONSTRUCTOR OUTFITS

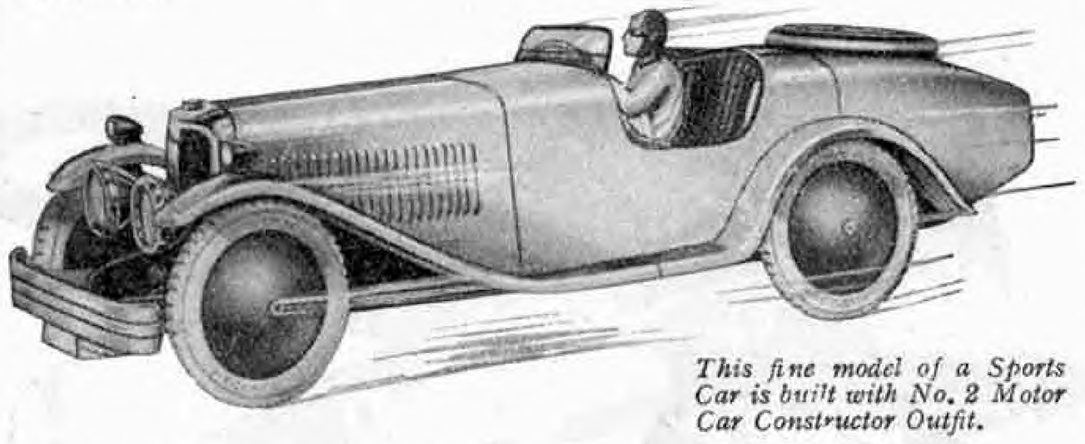
YOU WILL BE KEEN TO HAVE ONE!



No. 1 Motor Car Outfit. Price **10/-**

Boys, as soon as you see these fine Motor Car Constructor Outfits you will be keen to have one. The models they build are superb—sports four-seaters, coupés, speed cars and other perfect miniature reproductions, each one a beautiful model of its prototype.

The motor car parts are finished in rich enamel, nickel plate and chromium.



This fine model of a Sports Car is built with No. 2 Motor Car Constructor Outfit.

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are perfect examples of miniature automobile construction. Think of the fine fun you could have building these wonderful models, each one of which faithfully resembles its prototype. No. 1 Outfit is supplied complete with powerful Clockwork Motor. Price **10/-**

No. 2 MOTOR CAR CONSTRUCTOR OUTFIT

Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the model illustrated above. A powerful Clockwork Motor that gives a run of 150 feet on one winding is included in the Outfit. Price **20/-**



Motor Car Garage

MOTOR CAR LIGHTING SET

With this Lighting Set the headlamps of Motor Car models built with the No. 2 Motor Car Outfit can be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Height 5 in. Length 13 in. Width 7¾ in. Price **5/6**

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

"It loops and glides splendidly"

SAYS

C. W. A. SCOTT

. . . the famous airman after testing this wonderful



Free

QUAKER MODEL GLIDER

★ *You get it by return for only two coupons from* **"PUFFED" RICE** *or* **"PUFFED" WHEAT** *packets!*

This splendid working model glider (of light but strong wood) specially designed for long flights, was recently tested out thoroughly by C. W. A. Scott, hero of three record Australian flights and winner of the England-Australia Air Race, 1934, in under 3 days.

"*I spent a very pleasurable half-hour testing it,*" said the world-famous airman afterwards, "*it loops and glides splendidly . . . and the assembly is simple in the extreme . . . an ingenious model.*" This is the wonderful working model *you* can get FREE just by sending in the coupons cut from the side of two packets of "PUFFED" WHEAT or "PUFFED" RICE (or one from each).

These are the famous "foods shot from guns," so light, so tasty, so crunchy, that they tempt *any* appetite—even the hardest-to-please. And they're ready-to-eat straight from the packet.

Ask your grocer about them—*then use the form below*—and you'll have two marvellous surprises!

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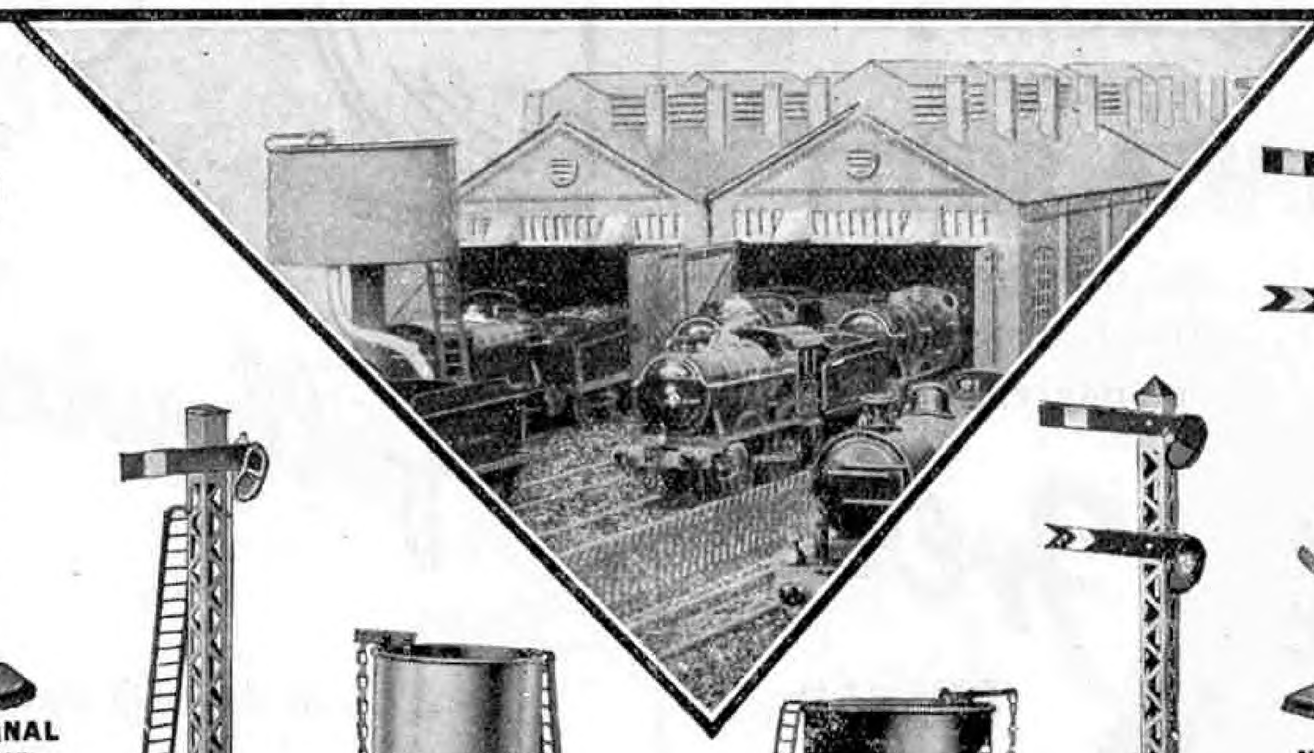
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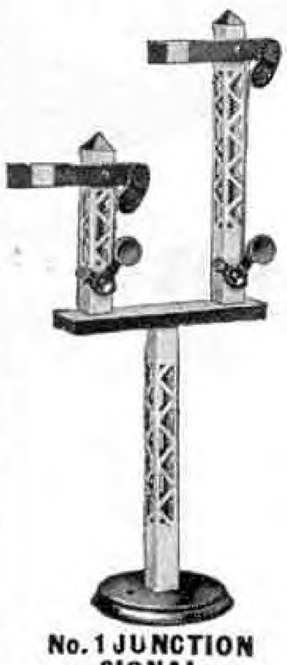
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Price 2/9



No. 1 SIGNAL
"Home" or "Distant."
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No.1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever.
Price 3/-



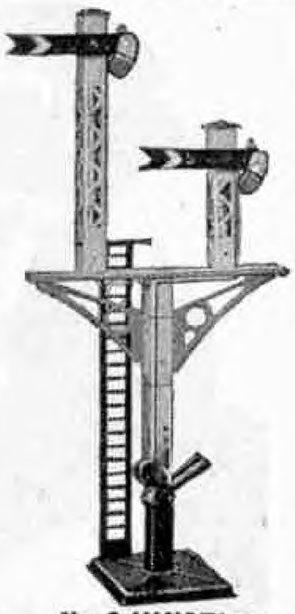
No.2 WATER TANK
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Fitted with flexible tube and valve lever.
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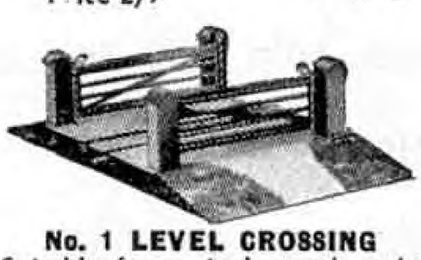
No. 1 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price 1/6



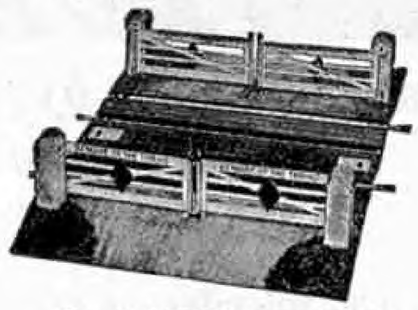
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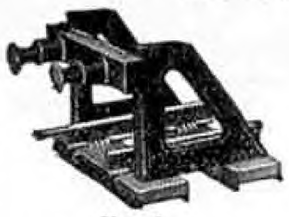


No. 1 LEVEL CROSSING
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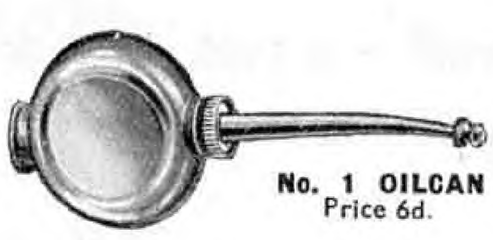


No. 2 LEVEL CROSSING
Measures 13½ x 10½ in., with two tracks of gauge O rails in position.
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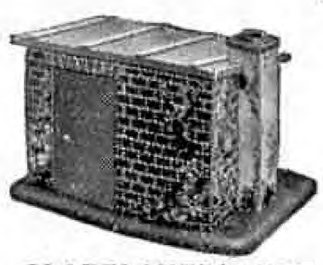
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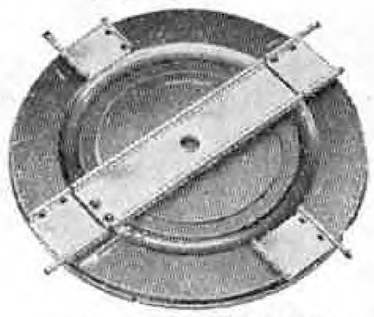
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("K" Type). The oil is ejected drop by drop by depressing the valve. Polished copper. Price 3/6



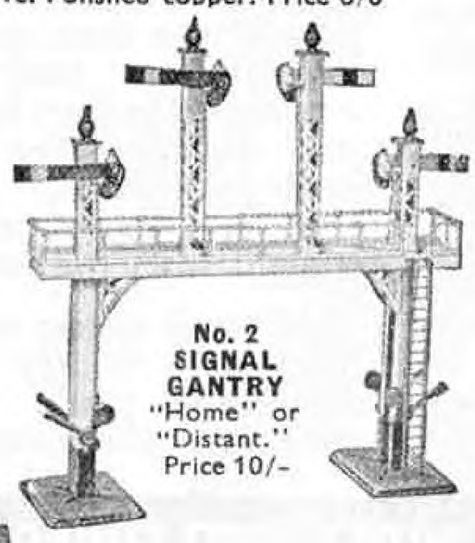
No. 1 SIGNAL CABIN
Finished in colours.
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No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price 4/11



No. 1 TURNTABLE
Price 2/6



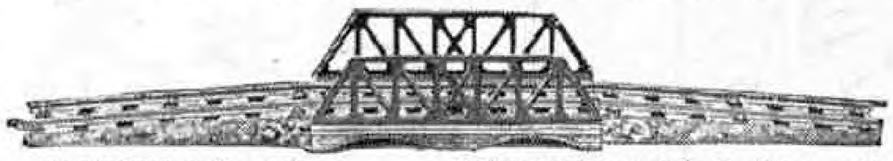
No. 2 SIGNAL GANTRY
"Home" or "Distant."
Price 10/-



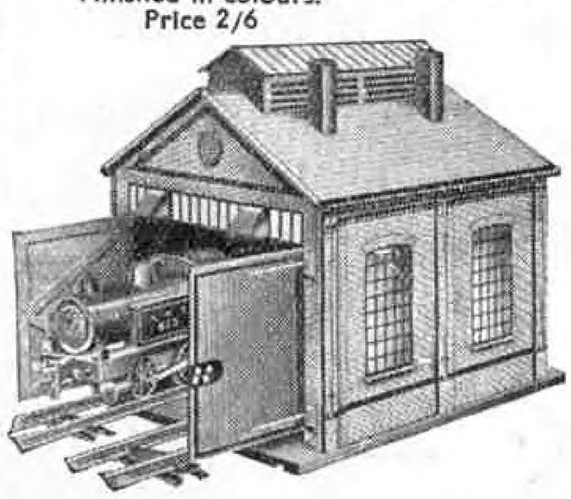
No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price 3/9



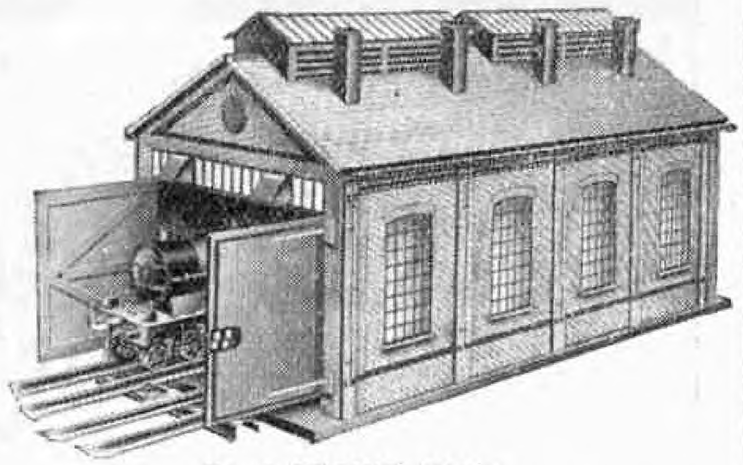
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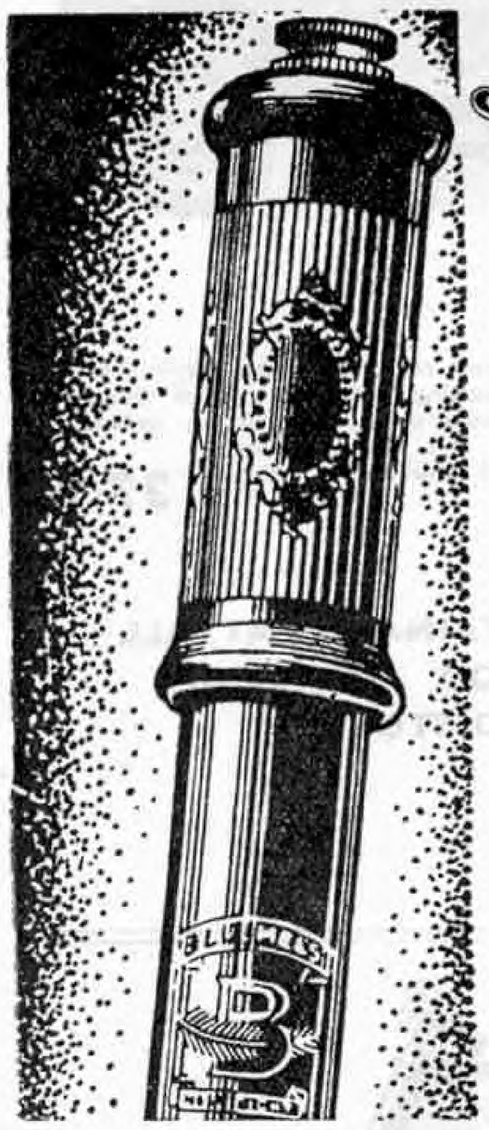
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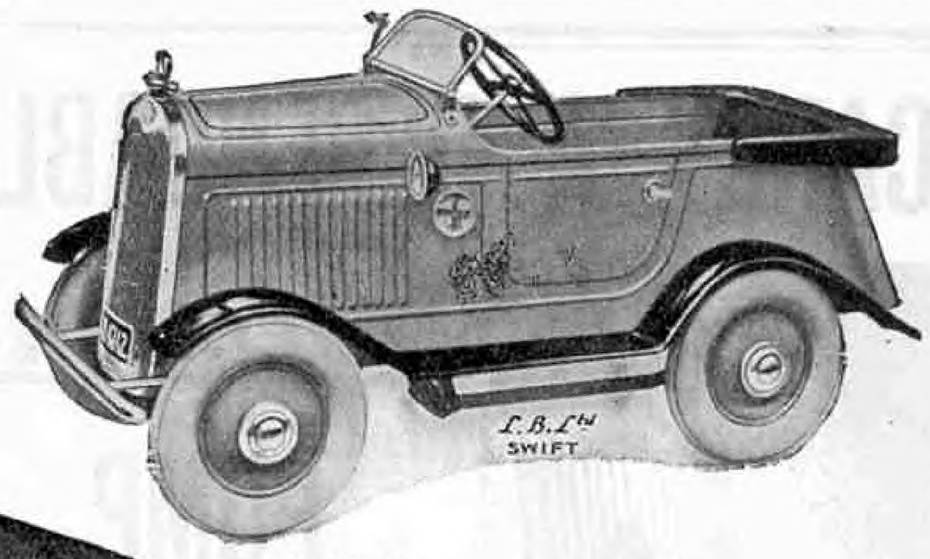
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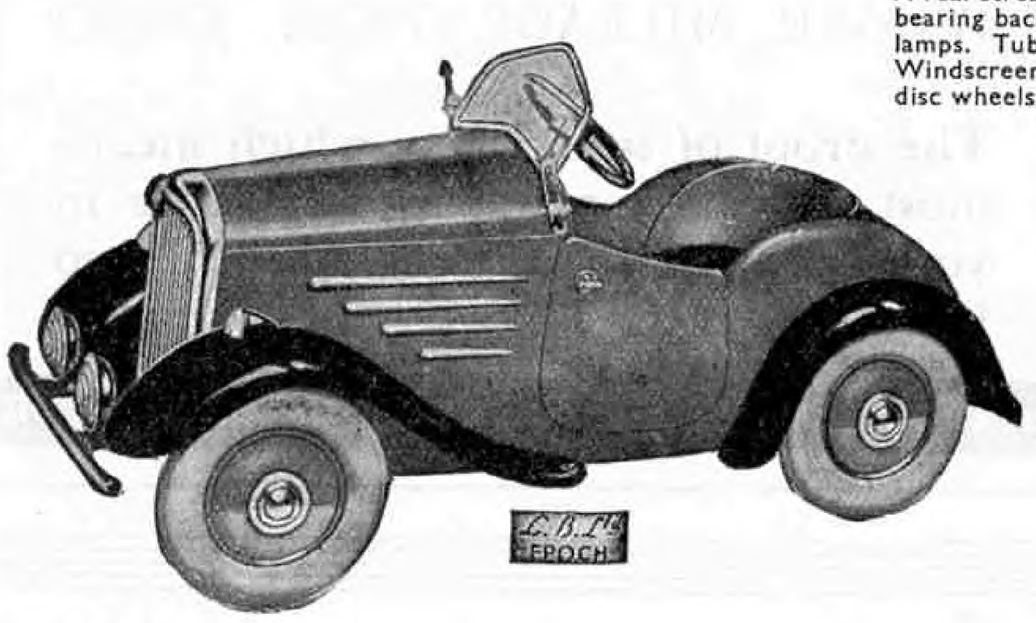
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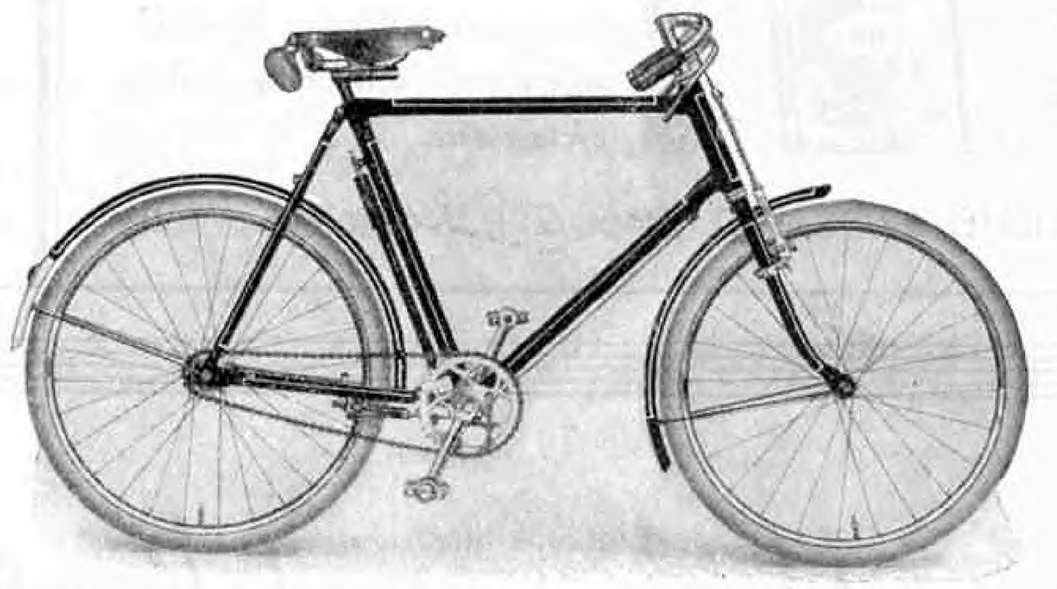


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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 5
May, 1936

With the Editor

A Duke who was a Coal Merchant

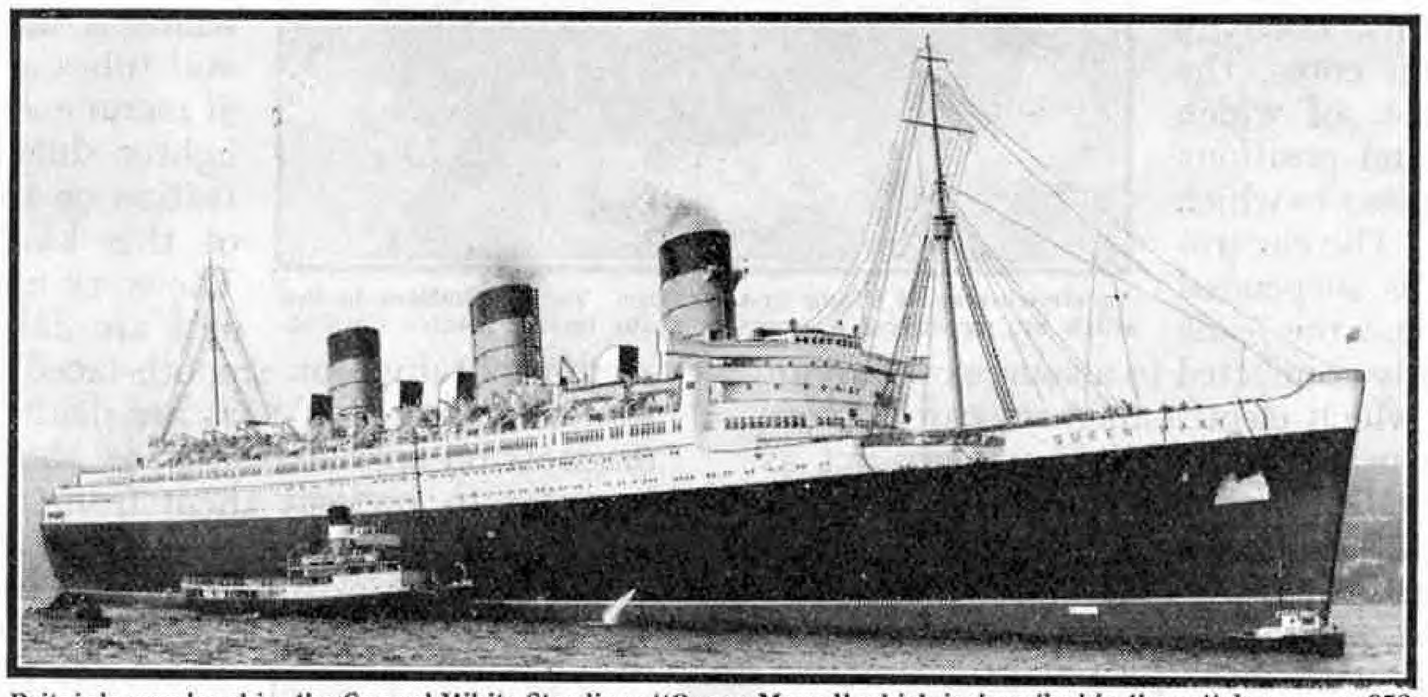
It is 200 years this month since the birth of the third Duke of Bridgewater, who is chiefly remembered by the canal built for him by James Brindley, the famous engineer. The charges made for transporting coal by road and river from the Duke's collieries at Worsley to Manchester and Liverpool were so heavy that he resolved to take it there on his own canal, and he called Brindley in to plan the necessary waterway. The idea of creating a new artificial river was sufficiently startling, for no canal for carrying merchandise then existed in England; but when Brindley proposed to take it across the River Irwell on a lofty bridge he was laughed at as a madman and his proposed aqueduct was sneeringly described as a castle in the air. It soon became a reality, however, and the novel spectacle then was seen of barges sailing over a bridge.

When Brindley built his aqueduct he did not anticipate that some day the Irwell beneath it would become part of a great ship canal between Manchester and the sea. His structure left insufficient headroom for traffic using the new canal, and a swing bridge therefore was constructed to carry the Bridgewater Canal over the waterway. This swing bridge was opened in 1893 and Brindley's "castle in the air" was then demolished.

The Duke's canal cost him about £220,000, and many times during its construction he was so short of money that he was compelled to send his agent round his tenants to collect any small sums that he could get. When the work was completed the Duke often watched the busy scene in his coalyard at Manchester, where people went with wagons, wheelbarrows, baskets and even aprons for supplies, and it is recorded that on one occasion he gave a customer a "lift up" with a sack of coal! The man was so astonished when he was informed who had helped him that he immediately dropped the sack, so that the Duke's well-meant effort was wasted.

Clock That Struck Thirteen

Visitors from all parts flocked to see Brindley's canal and the underground waterways beneath Worsley Hill along which barges penetrated to the workings of the Duke's coal mine. One of the curiosities they encountered at Worsley was a clock that struck 13 times at 1 p.m. The story is that the Duke's workmen excused themselves for late arrival in the afternoon by alleging that they did not always hear the single stroke that called them back at one o'clock. The Duke had noticed no delay in leaving off work at noon, when the clock struck 12 times, and devised this simple but remarkable scheme to ensure equal promptitude in returning.



Britain's wonder ship, the Cunard White Star liner "Queen Mary," which is described in the article on page 252. Our photograph shows the great vessel at Greenock, and is reproduced by courtesy of B. and A. Feilden, Liverpool.

Oil in Great Britain

The news that drilling for oil has begun on Portsdown Hill, Portsmouth, brings to mind the curious fact that although this country produces enormous quantities of coal of the very highest quality, it has not so far yielded any of the rival fuel. Previous efforts have been made to find oil in Great Britain, but these were not commercially successful, and at present we are compelled to import our requirements. It is expected that we shall have to wait two years to learn if there is any prospect that the boring now in progress will tap a deeply buried reservoir of petroleum, but the outcome of the work will be awaited with keen interest. It seems difficult to believe that forests of derricks will ever make their appearance in this country.

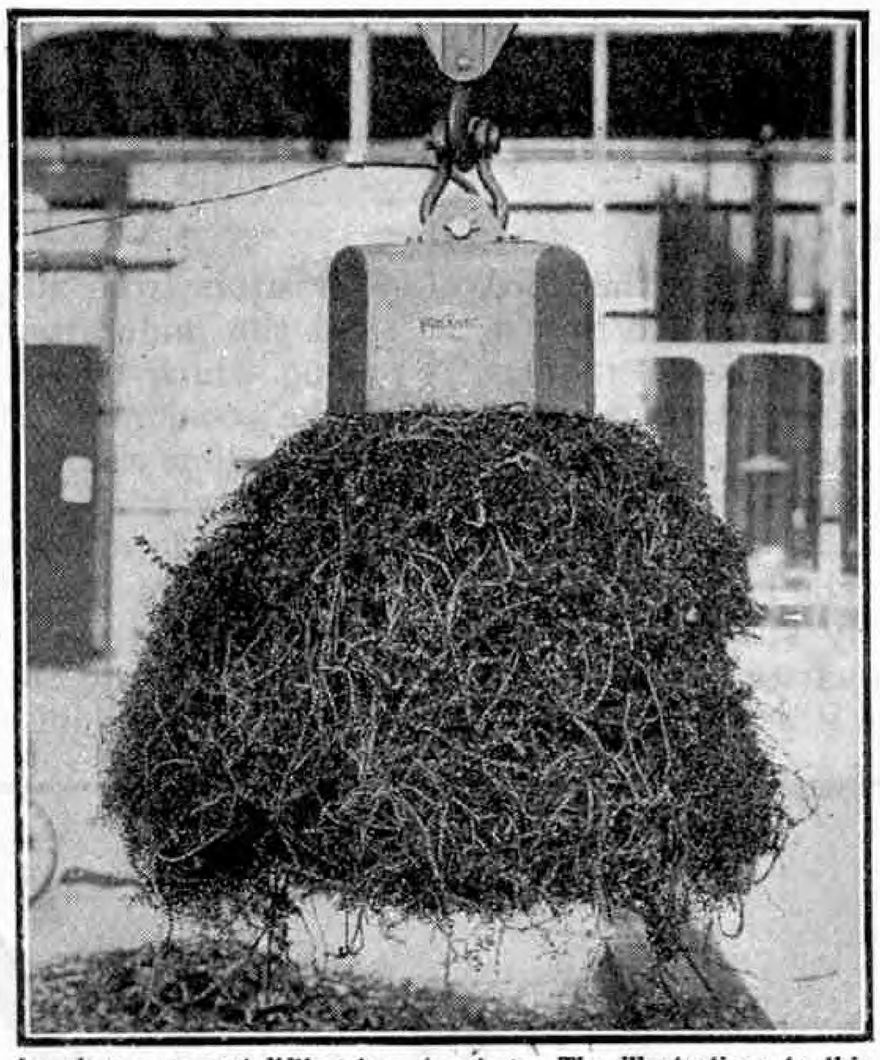
One reason for the widespread use of oil is the ease with which it can be stored and handled. This has led to its use in ships, for instance, and many vessels that formerly burned coal in the furnaces of their boilers now burn oil. The "*Mauretania*," the most famous of all great ships, was converted from coal to oil in 1921, and those who read the article on coaling giant liners that appeared on page 16 of the January issue will be interested to learn that the Orient liner "*Ormonde*" underwent a similar change a few years ago.

Electro-Magnets in Industry

Handling Large Masses of Steel and Iron

OUR cover this month shows an overhead travelling crane lifting an iron casting by means of a circular electro-magnet. Steel or iron articles so lifted are literally hung underneath the magnet, and are held there in a tenacious grip by an invisible force until they are released by the movement of a switch. Cranes of this type work swiftly and easily, and their use illustrates one of the many important applications of the electro-magnet in industry.

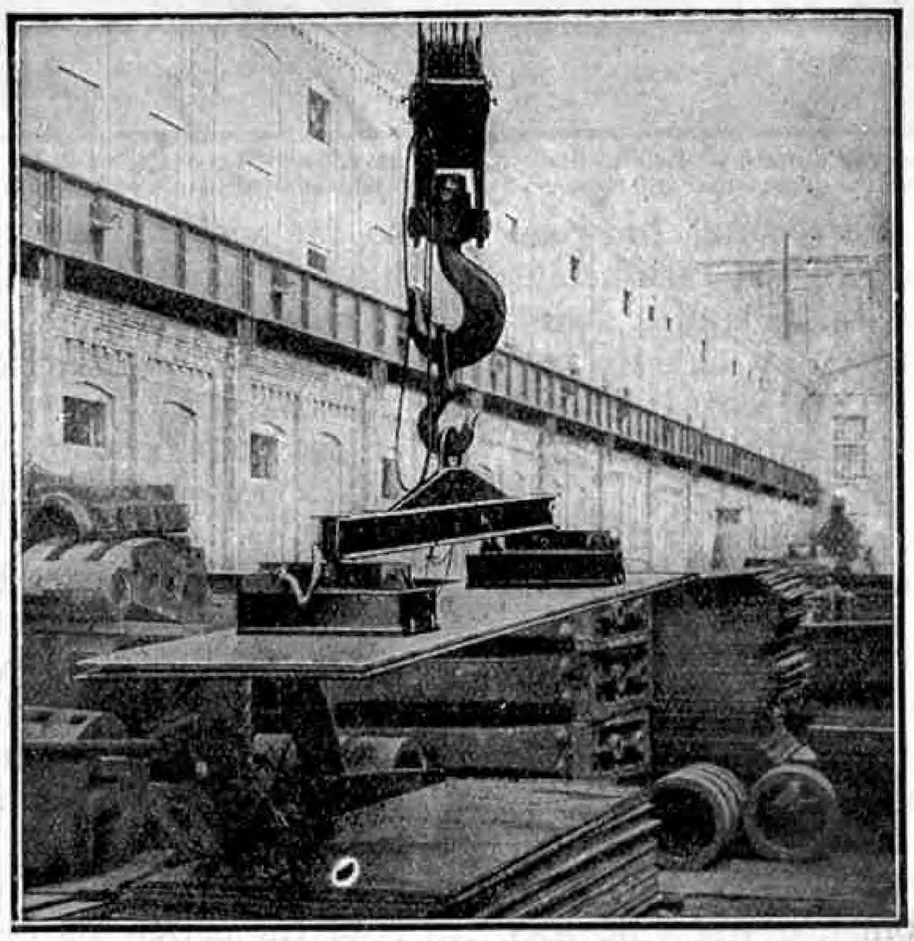
The principle on which an electro-magnet works is simple. A rod of soft iron becomes a magnet when an electric current is passed through a coil surrounding it, and it loses its magnetism immediately the current is switched off. The design of electro-magnets used in industry for lifting is based on this. Coils are wound round soft iron cores, the attracting ends or poles of which are given the shapes and positions best suited for the purposes to which they are to be applied. The electro-magnet thus built up is suspended by means of a crane, and the leads from its coils are suitably connected to a source of current.



An electro-magnet lifting iron turnings. The illustrations to this article are reproduced by courtesy of the Igranic Electric Co. Ltd.

It is the ease with which electro-magnets can be controlled that makes them so valuable. They only act as magnets when current is passing through their coils, and therefore can readily be made to pick up or put down their loads exactly when required to do so. This cannot be done with permanent magnets, which cannot easily be made to part with the iron or steel they pick up; and electro-magnets have the further advantage over those of the permanent kind that they can be made much more powerful without difficulty by simply using larger windings, with more turns in them, and increasing the strength of the current.

Electro-magnets are used very largely for lifting heavy masses of iron and steel in foundries, factories and shipyards. Cranes of various types are installed to facilitate the handling of the metal. Those of the ordinary type involve such accessories as chains, ropes, and grappling hooks, but these are unnecessary when a crane is fitted with an electro-magnet. The operation of such a crane is very simple. The magnet is lowered until it is in contact with the load and the current is switched on. The crane then lifts the magnet, with its load adhering to it, and transports it to the new position desired. The magnet is then lowered to a safe position at rest, and the current is switched off, when the load is immediately released.



Lifting ships' plates by means of electro-magnets.

Different types of electro-magnets for lifting purposes have been designed in order to deal with the various tasks for which such devices are suitable. Handling billets, castings, pig iron and scrap is heavy work, and the circular magnet shown on our cover is an example of the more powerful magnets applied to purposes of this kind. The working surface on the underside of this magnet is heavily ribbed, so that it will have better gripping power on the irregular shapes with which it has to deal. Plates, bars and tubes are dealt with by means of rectangular magnets designed for lighter duty, and the lower illustration on this page shows magnets of this kind lifting ships' plates. The working surfaces of these magnets are flat, so that a good grip is readily obtained on smooth-faced metallic objects. Thin sheets or long thin bars are dealt with by mounting the magnets on spreader-bars, as shown in our illustration, in order to prevent them from drooping at their ends. If this were allowed, the contact with the magnetic pole might not be sufficient to ensure the safe transport of the load.

The upper photograph on this page shows a heap of turnings being lifted by means of an electro-magnet. In this case, and in those in which piles of scrap or small pieces of metal are involved, magnetic induction plays a part. Each piece of scrap metal in contact with the magnetic pole itself immediately becomes capable of attaching to itself a second piece, and this in turn is similarly converted into a small magnet. Thus an immense mass of turnings or scrap can readily be lifted, although the greater part of the mass is not actually in direct contact with the magnet.

Atmospheric conditions make no difference to the employment of a magnet, and electro-magnetic cranes are frequently employed in the open air. They can indeed be employed under water, and there they prove useful in salvaging operations.

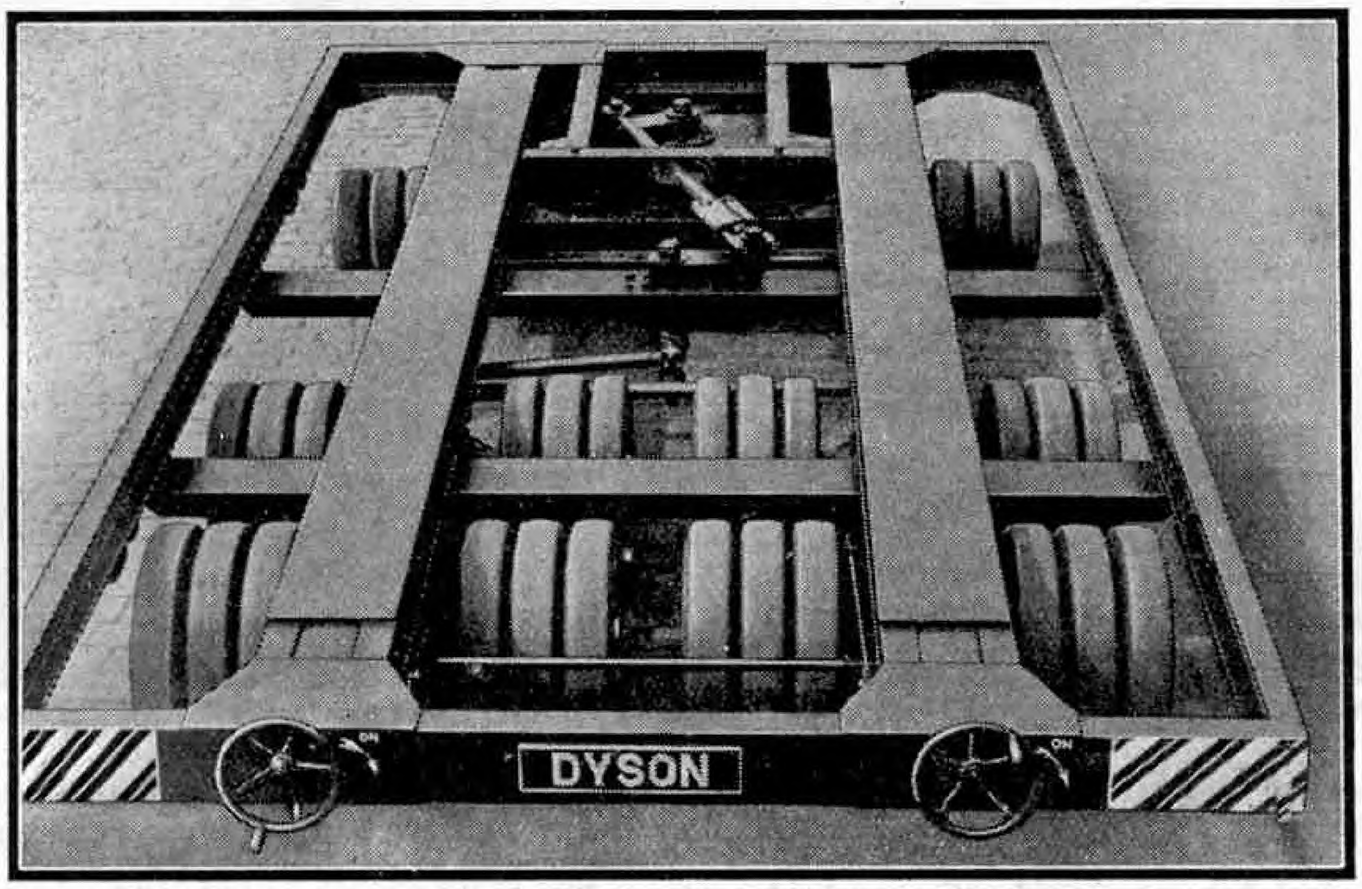
A New 65-ton Trailer

Transporting Heavy Machinery by Road

SPEED in transport is an important factor in modern industry, and every effort continually is being made to reduce the time during which goods of all kinds are in transit by road and rail. Many special difficulties have to be overcome in dealing with problems that arise in this connection. One of these concerns the transport of bulky machinery, such as large engines, boilers and transformers. These often are too large to be carried intact by ordinary means, and often valuable time must be spent in dismantling a newly-built machine in order to reduce it to parts of convenient size for transport, and in re-assembling it on its arrival at its destination. The cost of the work involved in these operations also has to be taken into account.

One of the means adopted for reducing the time spent in the transport of exceptional loads of this kind is the provision of trailers specially designed to carry them. These trailers usually are of great size and are hauled by lorries or traction engines. They travel comparatively slowly and the time taken in carrying a machine by road naturally exceeds that required to despatch its separate parts, but a gain is apparent when the times required in the two cases to complete the installation are compared.

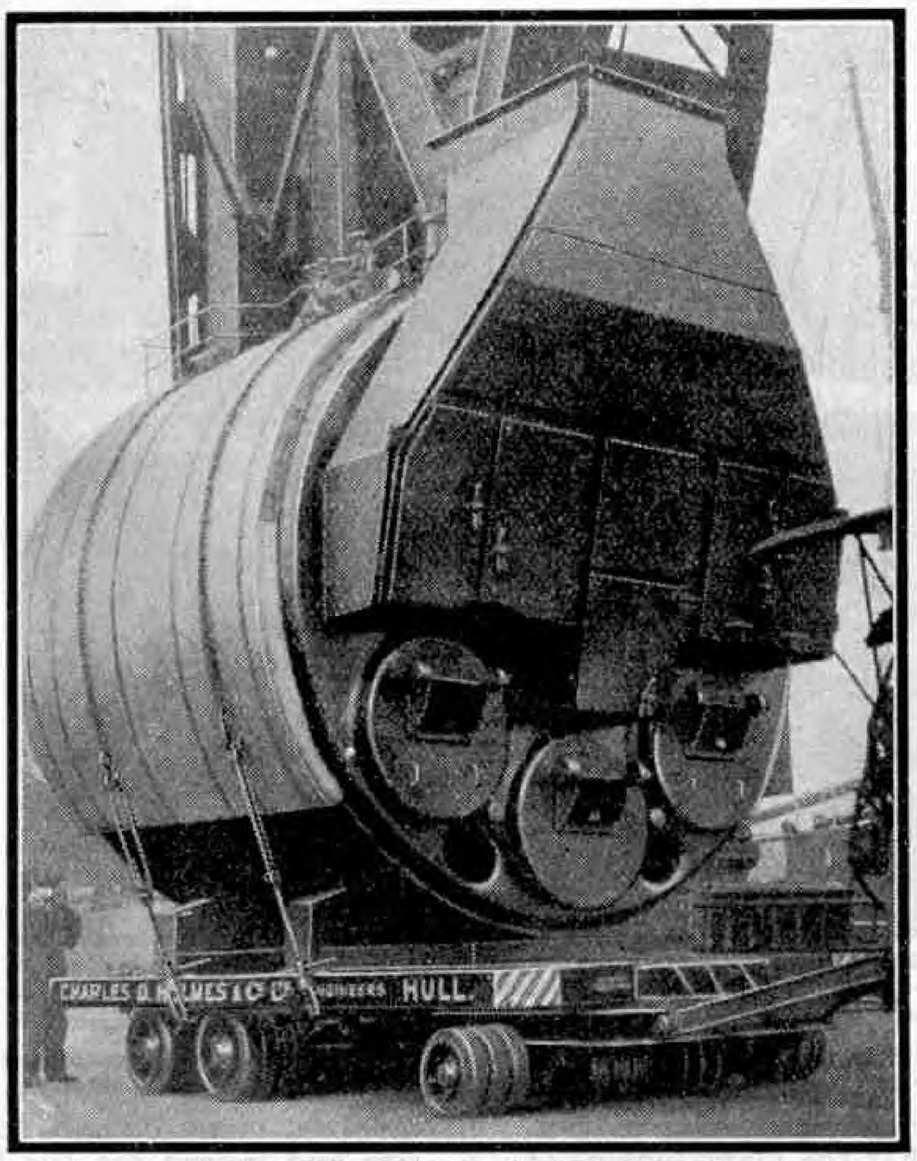
An interesting trailer built by R. A. Dyson and Co. Ltd., Liverpool, for Charles D. Holmes and Co. Ltd., of Hull, is illustrated on this page. It was designed to carry engines and boilers, either fully erected or in large sections, from the works of Charles D. Holmes and Co. Ltd., to the docks, where they are hoisted directly into position in the vessels for which they are intended. It is 18 ft. in length and 10 ft. 6 in. in width and is carried on 12 triple-tyred wheels. The wheels are arranged in three rows of four, each row comprising two pairs of wheels carried on a short axle mounted on springs. This arrangement allows the wheels to adapt themselves to surface irregularities and road camber. The load therefore is always evenly distributed and the maximum weight per inch width of tyre is only 7 cwt.



Rear view of the Dyson 65-ton trailer, showing 10 of the 12 triple-tyred wheels, and the steering turntable over the front axle. The illustrations on this page are reproduced by courtesy of R. A. Dyson and Co.

An additional aid in spreading the load over the wheels, and thus of avoiding damage to the road surface, is a balance beam connecting the second and rear lines of axles. This is particularly useful when ascending or descending a hill, when it prevents one row of wheels from being overloaded.

Steering is effected by means of a turntable placed centrally over the front axles and connected to them. The second pair of axles are independently pivoted at their centres, and are connected by shafts to the turntable so that the wheels mounted on them follow in the tracks of those of the first row. Thus the vehicle turns easily and smoothly, and undue wear on the tyres is avoided. Smooth running is ensured by the use of Timken roller bearings in the wheel mountings and Ransome and Marles needle roller bearings on the compensating arrangement between the second and rear axles, and thus jerky action that may disturb the position of the load is prevented. Solid Dunlop rubber tyres are fitted to all the wheels, the triple tyres on the eight rear wheels being 20 in. by 26 in. by 6 in. in dimensions, and those on the four front wheels measuring 20 in. by 14 in. by 6 in.



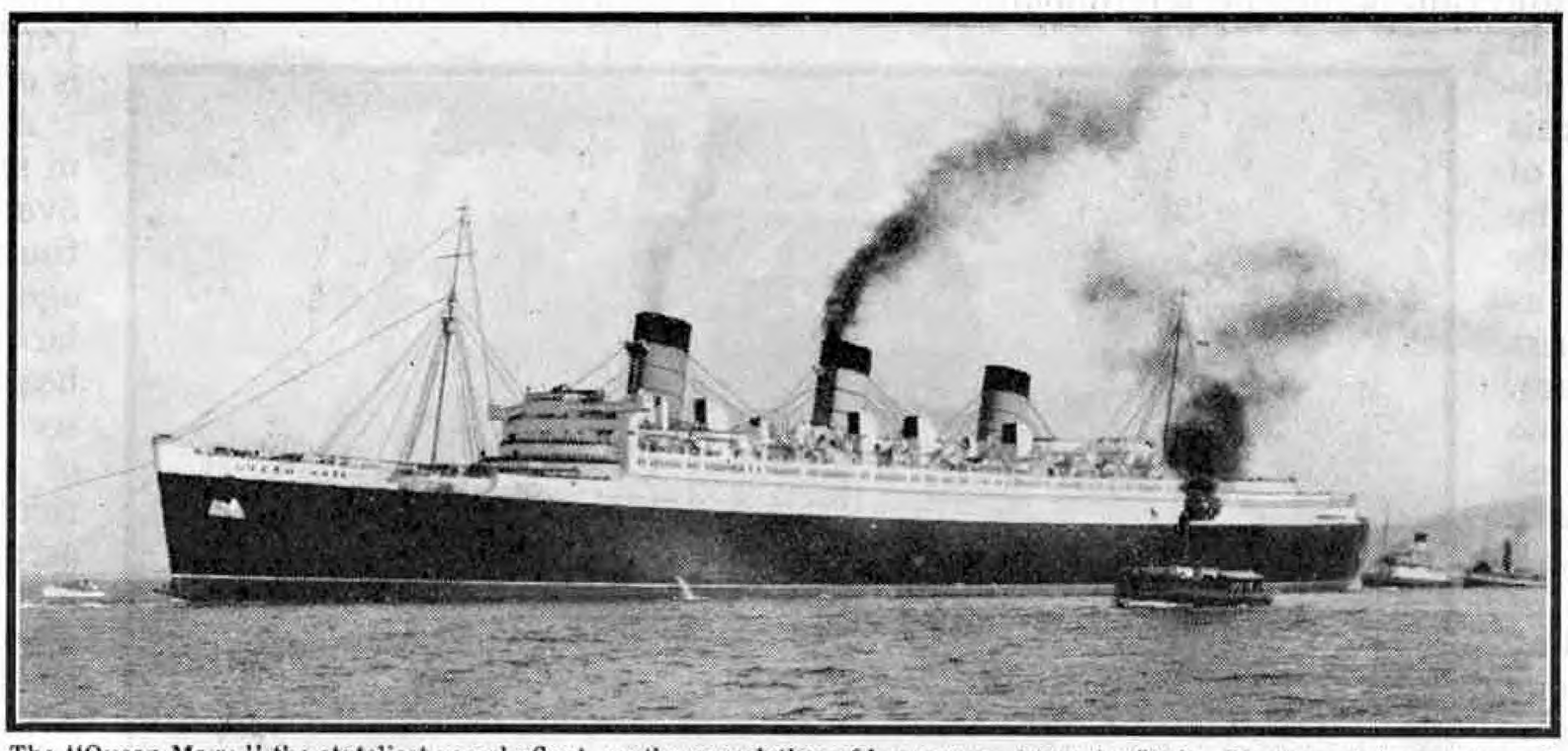
A giant boiler loaded on the 65-ton trailer.

The main chassis members of the unit consist of two 8 in. by 3 in. channels with plates $13\frac{1}{2}$ in. in width and $\frac{1}{2}$ in. in thickness riveted at the top and bottom, and the general design of the platform assists in the correct distribution. The trailer is so low that tall machinery can be carried under bridges where normally there would not be enough clearance.

"Queen Mary"

More Details of Britain's Greatest Liner

THE departure of the Cunard White Star liner *"Queen Mary"* from Clydebank provided a unique thrill for British people at home and throughout the Empire. Her passage down the Clyde was witnessed by thousands of spectators from all parts of Great Britain, who watched with breathless interest as she safely negotiated one by one the troublesome bends in the river. As she moved onward into more open water she passed the burned-out *"Atlantique"* waiting to be towed up the river to be broken up, and then occurred a moving little episode. *"Queen Mary,"* in all the glowing splendour of her youth, sent out a siren blast of recognition and sympathy; and received in reply a melancholy note from the French liner with whom fate had dealt so hardly.

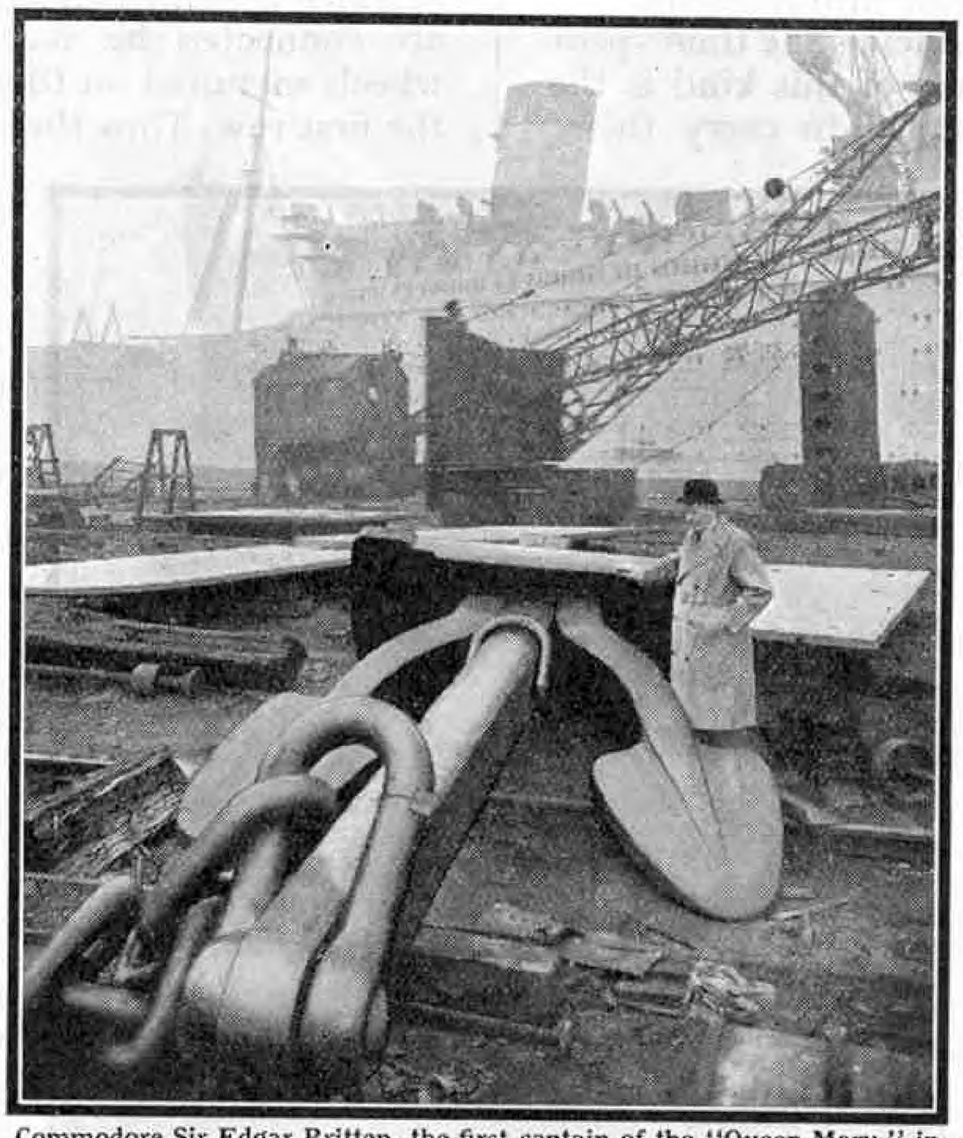


The "Queen Mary," the stateliest vessel afloat, on the completion of her voyage down the Clyde. Photograph by courtesy of B. and A. Feilden, Blundellsands, Liverpool 23.

When *"Queen Mary"* reached her moorings at Greenock she continued to be a centre of attraction as she lay there brilliantly illuminated, with the waves rippling round her for the first time. Then came the southward voyage to Southampton, where again she was greeted by immense crowds as she was carefully manœuvred into the King George V graving dock, the largest in the world, for the usual examination of the hull before the official trials.

The gross tonnage of the *"Queen Mary"* is 80,773, and she is 1,018 ft. in overall length and 1,004 ft. in length on the waterline. Her beam is 110 ft. From keel to masthead she measures 234 ft., and if she were placed in Trafalgar Square her foremast would tower 64 ft. above the highest point of the Nelson column. An interesting indication of her immense size is given by the fact that 70,000 gallons of paint were required to cover her exterior and interior surfaces. These have a total area of 50 acres, or roughly twice that of Waterloo Station.

The top of the first of the vessel's three giant funnels is 180 ft. above the keel and more than 70 ft. above the highest deck. Its greatest diameter is 36 ft. and its circumference 100 ft. The remaining funnels are equal in width, but slightly less in height, an arrangement that helps to keep the decks and ventilators of the vessel clear of smoke and fumes.



Commodore Sir Edgar Britten, the first captain of the "Queen Mary," inspecting one of the vessel's 16-ton anchors. This illustration and those on the opposite page are reproduced by courtesy of Cunard White Star Limited.

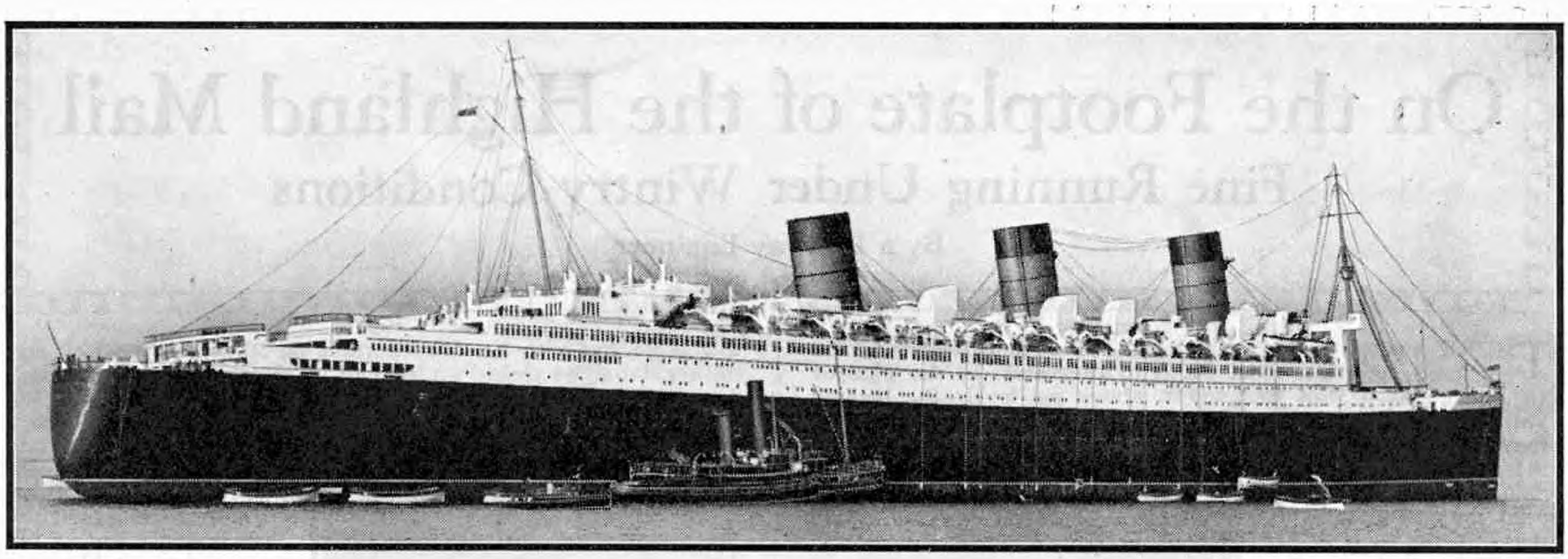
It is almost 96 years since the first Cunard liner made her appearance. This was the *"Britannia,"* which began her service in 1840. The *"Britannia"* was a large vessel for her time, but so great have been the advances in shipbuilding and engineering since her day, that the giant funnels of the latest addition to the Cunard fleet are wide enough to enable her hull to be passed through them!

When the *"Queen Mary"* was being planned, the utmost care was taken to ensure that she should be the most up-to-date and scientifically constructed vessel in the world. More than 7,000 experiments were made on models before her form was finally determined. Each model was tried in the experimental tank at Clydebank of John Brown and Co. Ltd., her builders. All the features of an Atlantic hurricane can be reproduced in miniature in this tank, and the models travelled a total distance of more than 1,000 miles up and down it during the trials, the result of which is a hull of a design to allow full use to be made of the ship's engines and to enable the sailing programme aimed at by her owners to be maintained in all weathers.

The hull structure of the *"Queen Mary"* comprises 12 decks, from the sun deck down to the lower decks, which are discontinuous in order to leave room for her extensive machinery. An unusual feature of its construction has been the use of special steel with the high tensile strength of 40 lb. per sq. in. in the superstructure. Altogether the total weight of metal in the hull and machinery is more than 50,000 tons, and the launching weight of the vessel, that is the weight of the hull alone, without machinery or equipment, was about 40,000 tons.

Steel plates ranging in length from 8 ft. to 30 ft. were riveted together in forming the hull. These plates and the girders employed in construction were hoisted into position by means of derricks erected in long lines along each side of the building berth, and as the vessel rose higher electric lifts were installed in order to carry the workmen to their tasks. Part of the riveting was carried out by hand, but a large proportion of the 10,000,000 rivets required were hammered in by means of hydraulic and pneumatic machines. If placed end to end these rivets would stretch a distance of more than 270 miles, or nearly from London to Newcastle.

One of the greatest feats accomplished during the building of the *"Queen Mary"* was the transport from Darlington to Clydebank of the stern frame, shaft brackets and rudder, which together weigh nearly 600 tons. The rudder itself weighs more than 140 tons. It is the largest ever constructed for any ship, and the task of hoisting it into position involved many days of intricate work. The anchors are of giant size and indeed are the largest ever installed in an ocean liner. Each weighs 16 tons and is of special design. The anchor cables,



wire hawsers and ropes used on the vessel have a total length of more than four miles, and special experiments were made in order to find the best position on the bows of the vessel for the hawse pipes, through which the anchor cables run.

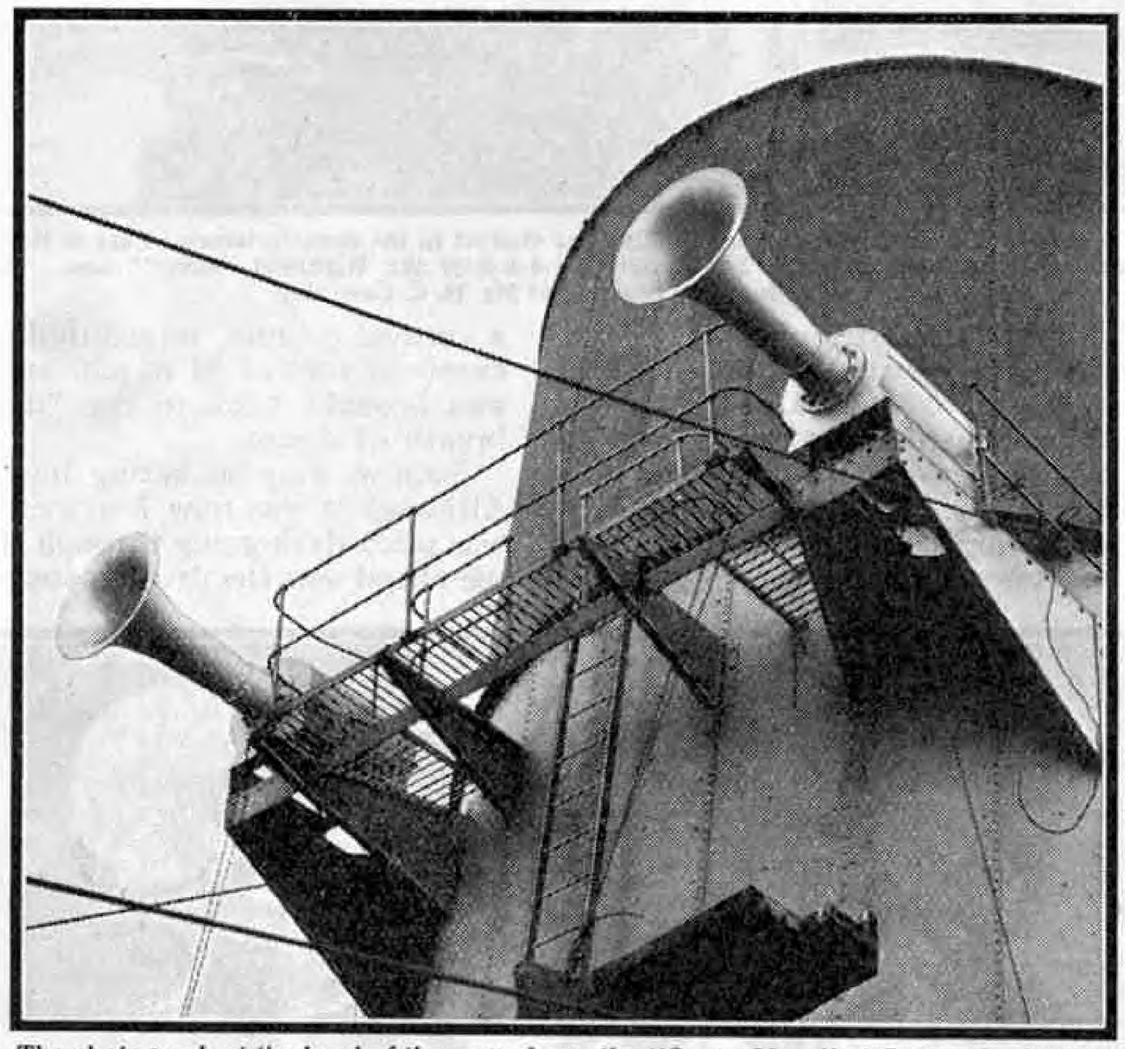
Immense power is required to drive a great vessel through the water at high speed. The space devoted to machinery in the "*Queen Mary*" therefore is unusually large, and in length actually rivals some of the largest Atlantic liners. Four sets of Parsons single reduction gear turbines are installed. These are independent and act on four screw propellers. Each set consists of four turbines working in series and driving through pinions a large gear wheel connected to the line shafting. The casings of two of the turbines incorporate astern turbines, for use when reversing or manœuvring, that drive the outer propeller shafts. Altogether there are 257,000 turbine blades, varying in length from nearly 2 in. to more than 16 in., and every one of these was tested separately and fitted by hand.

Each of the four giant gear wheels is 14 ft. in diameter, and together they weigh nearly 320 tons. In spite of their colossal size, they have been constructed to very fine limits of workmanship. Each is cut to an accuracy of a thousandth of an inch, and the process of cutting each wheel occupied from two to three months. The gear cases weigh 200 tons and have been fitted to a limit of 1½ thousandths of an inch.

Steam for the four sets of turbines is supplied from 24 enormous boilers with a working pressure of 400 lb. per sq. in., occupying four rooms. The number of tubes in these boilers is nearly 160,000 and the main steam piping is more than 2,000 ft. in length. Three cylindrical boilers with a working pressure of 250 lb. per sq. in. also are installed. Steam for kitchen purposes is supplied by three double-ended boilers in a separate room, and these can be run independently of the main boilers, whether the vessel is at sea or standing in harbour. Oil fuel is used. This is stored in nearly 50 bunkers with a capacity of 6,300 tons, and nearly 3,000 ft. of piping lead from these to the furnace burners, of which there are nearly 200. There are six filling stations for oil fuelling and the bunkers can be refilled in eight hours.

The propellers of the "*Queen Mary*" are nearly 20 ft. in diameter and are the largest in the world. Altogether eight have been provided, leaving four spare ones for emergencies and replacements. They are of turbiston bronze and are four-bladed. The casting weight of each was 53 tons, and the molten metal was carried to the mould in huge ladles suspended from overhead travelling cranes that carried 20 tons. The casting took eight days to cool off, and after machining and polishing weighed 35 tons, or 10 tons more than the largest propellers previously manufactured. Each propeller was subjected to a very severe test in order to ensure perfect balance, and when on the balancing machine the slightest touch of the finger on the extreme edge of the blade was sufficient to cause it to revolve.

Electricity is used for practically all purposes in the new liner except that of actually propelling her, and she can fairly be described as the greatest electric power station afloat, for the seven 220-volt, 1,300-kW turbo-generators with which she is equipped have sufficient capacity to supply the full services of a town of nearly 150,000 people. Three of the sets provide current for deck machinery and hotel services. The four remaining turbo-generators supply power for driving auxiliary machinery in connection with the propelling plant and serve the lighting installation. One usually will be a spare, but all four can be run together. The two groups of generators are housed in separate rooms, and are designed to work independently. They can be interconnected, however, so that if one of them fails the other can supply a proportion of the current required for the services it maintains. Altogether 4,000 miles of cable are required to distribute the electrical energy generated.



The photograph at the head of the page shows the "Queen Mary" at Greenock after her trip from the builder's yard at Clydebank. In the lower illustration, the huge sirens on the forward funnel of the vessel are seen. These can be heard at a distance of 10 miles.

From a navigational point of view the "*Queen Mary*" is wonderfully planned and every possible precaution is taken to ensure against mishap. The steering gear is duplicated so that if anything should go wrong with one set the other can be brought into use in a few seconds. A very small wheel is moved by the helmsman, and the power he exerts is increased stage by stage by gigantic hydraulic rams in order to move the 140-ton rudder easily and rapidly. The gyro pilot also is installed. When the course required has been set, this automatic steersman maintains it correctly, whatever the weather may be, and the steering is then more accurate than that of the most skilled of helmsmen.

The comfort of the officers on watch has been carefully studied. The wheelhouse is heated, and the front of the bridge itself is curved in such a manner that the air meeting it is deflected upward, to pass through a slot at the top of the bridge front and create a high pressure area in which the air is moving upward clear of the bridge. Anyone standing immediately behind the bridge front therefore is in an area of calm. Even in the exposed position in the crow's nest high up on the foremast, 130 ft. above the waterline, the men on watch will be well protected from the weather, for a glass screen is provided and electric heaters add to their comfort. The crow's nest is reached by climbing 110 iron steps inside the foremast, and telephonic means of communicating with the bridge are provided.

The "*Queen Mary*" is provided with 24 motor lifeboats, built of steel and 40 ft. in length, each of which can carry 145 people.

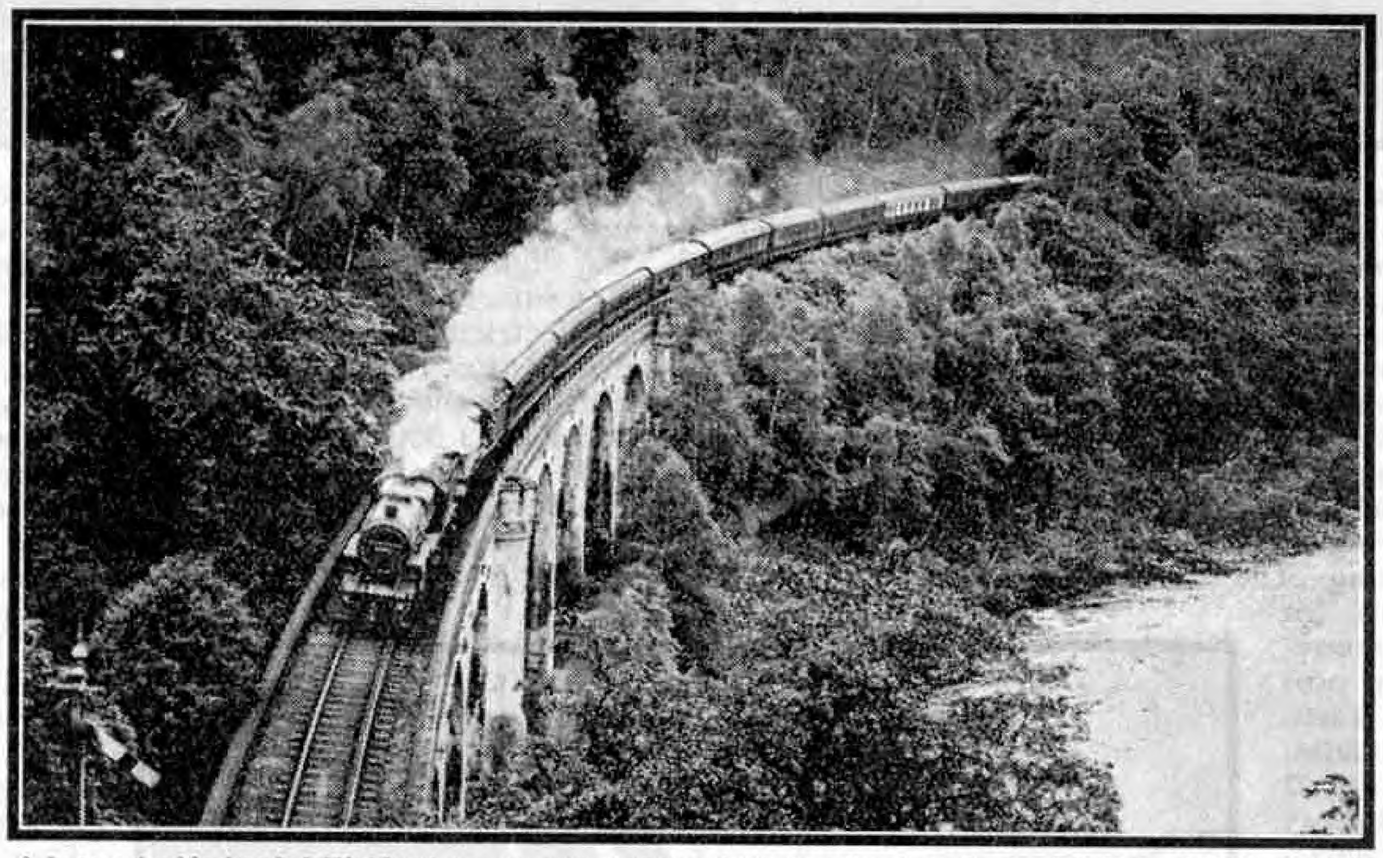
On the Footplate of the Highland Mail

Fine Running Under Wintry Conditions

By a Railway Engineer

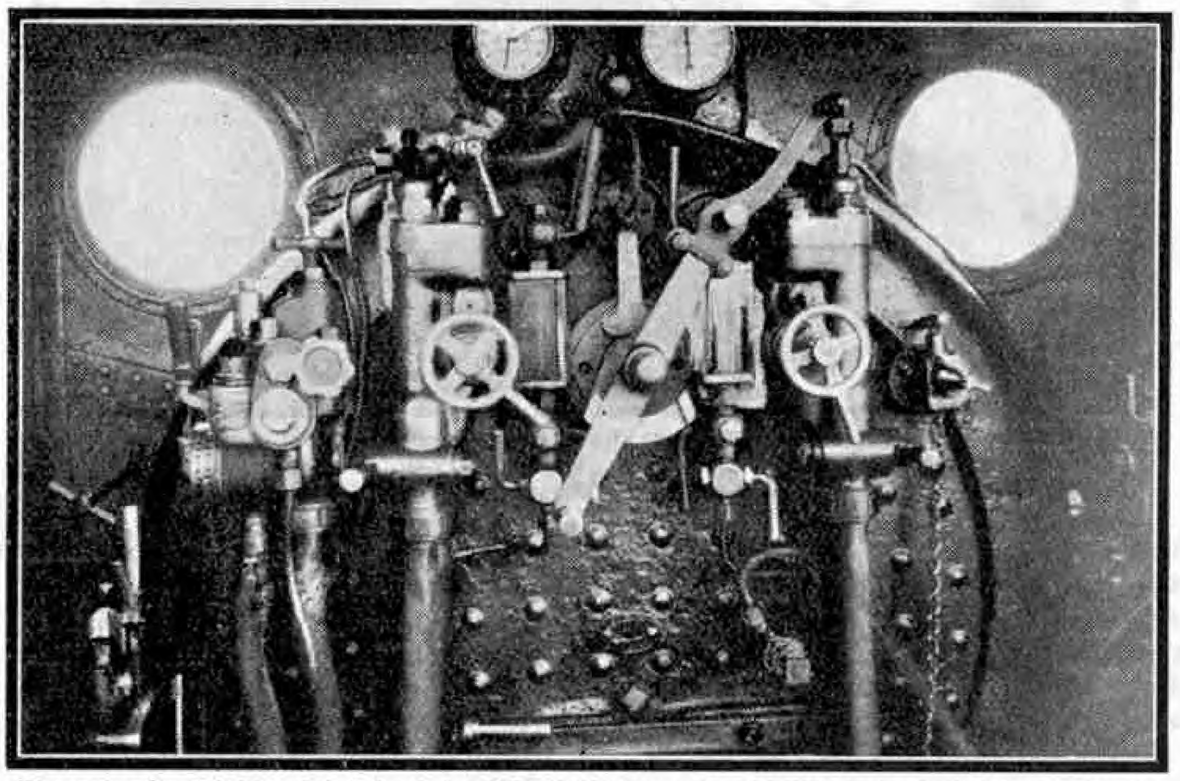
THERE is surely no more fascinating route in Britain than the Highland main line from Perth to Inverness. In the Pass of Druimuachdar it rises to 1,484 ft. above sea level—the highest altitude of main line railways in these islands—and at all times of the year train operation is fraught with considerable difficulty. It is indeed an eloquent testimony to the severity of the grades that the efficient Stanier 2-cylinder 4–6–0s are limited to a maximum tare load of 255 tons up the worst banks; on the Western Division these engines take up to 450 tons unpiloted, and I have timed one of them at 70 m.p.h. on the level with a gross load of 490 tons behind the tender.

I was privileged to ride from Perth to Inverness on the footplate of the 6.25 a.m. North Mail, and wintry weather with deep snow on the Grampians, combined with splendid locomotive work, made the trip one of the most enthralling runs I have ever experienced.



A heavy double-headed Highland express crossing the viaduct in the densely-wooded Pass of Killiecrankie. The engines are a standard L.M.S.R. 2-6-0 piloting a 4-6-0 of the Highland "River" class. Photograph reproduced by courtesy of Mr. H. C. Casserley.

This remarkable train carries, in addition to the postal section, sleeping car portions from both Euston and King's Cross, and a breakfast car; it is easily the heaviest train on the Highland and also considerably the fastest. On the day of my trip, an icy morning in mid-January, we had a load of no less than 15 bogie coaches, 455 tons tare and 490 tons with passengers and mails. Our train engine was No. 5086, a Stanier 4–6–0 in charge of Driver Nicholson and Fireman Wilson of Inverness; but with such a load piloting was absolutely essential, and we had in front a standard "Mogul" of the parallel-boiler type, No. 2805, with Driver Robertson of Perth at the regulator.



The cab of a Highland 4-6-0 of the "Castle" class, showing the principal fittings. In the left-hand corner is the handle of the steam reversing gear.

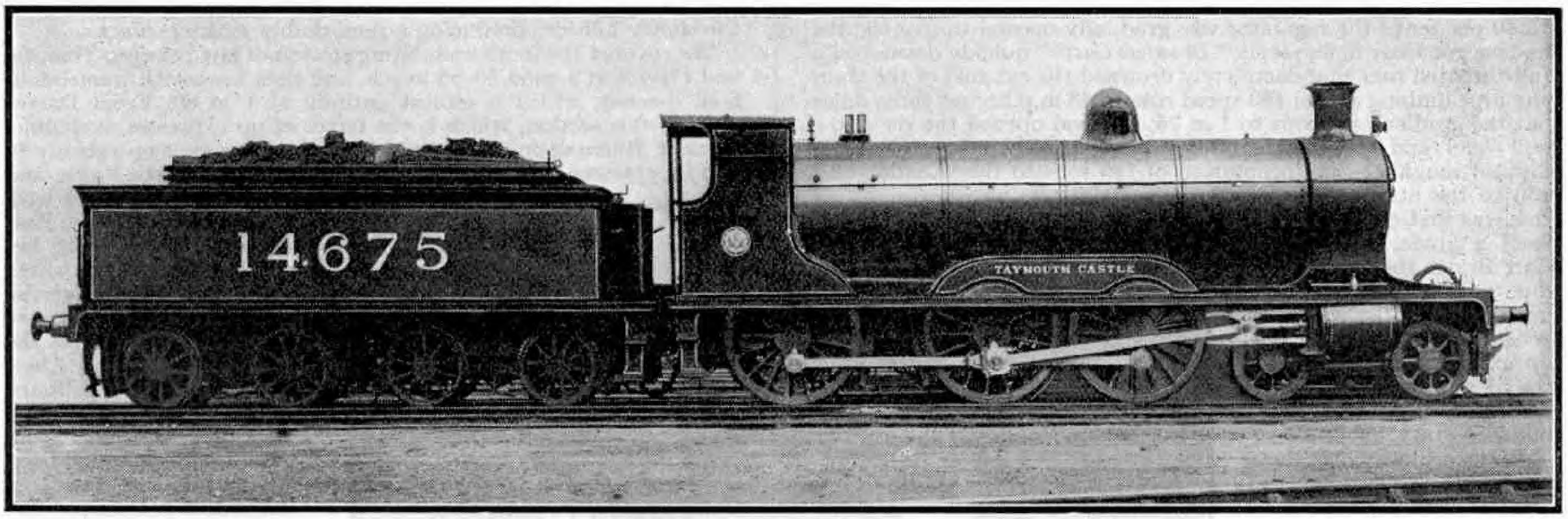
Before 6 a.m. the Post Office sorters were at work. The vans equipped with the pick-up apparatus are mighty cold in such weather and the men were wearing overcoats and great mufflers under their yellow overalls. I was glad of the warmth in the cab of No. 5086. The footplate arrangements of these engines are almost identical with those of the "Princess Royal" class 4–6–2s, except in respect of the fire-doors. The "Princesses" have fireclay doors, which slide outward on rollers; whereas these 4–6–0s have an ordinary hinged door similar to that of the "Royal Scots." Mail traffic was so heavy that it was not until 6.42 a.m. that we got the "right-away," but then it was to make a brilliant start indeed.

As far as Stanley Junction we are on the route of "*The Granite City*" express, the running of which I described in the "*M.M.*" for April 1935. Up continuously rising grades speed rose to 50½ m.p.h. at Luncarty, but then we slackened severely to take the sharp curve on to the Highland line at Stanley. The grade now steepened to 1 in 93, but with No. 5086 working on 30 per cent. cut-off and full regulator, we picked up from 15 to 27 m.p.h. in 1½ miles, and down the sharp fall to Murthly we quickly attained 55 m.p.h. We were through this station, 10¼ miles, in 15¾ minutes, and already 2¼ minutes of our late start had been regained.

From Stanley Junction to Blair Atholl the line is single, but at the passing loops tablets are exchanged at full speed. The apparatus is almost identical with that used in Ireland on the N.C.C. section of the L.M.S.R. which I described in the January 1936 number of the "*M.M.*," when writing of the "*Portrush Flyer.*" We were now launched on the 1 in 80 ascent to Kingswood Crossing; Nicholson advanced the cut-off to 40 per cent. and the beat developed into a tremendous roar. The pilot was a thrilling sight. The glare from her fire silhouetted the front of No. 5086, and in the darkness her exhaust was a vertical column, tinged dull red. We breasted the summit at the excellent rate of 34 m.p.h. and almost immediately the regulator was brought back to the "drifting" position, giving the merest breath of steam.

Soon we were bucketing down the 1 in 80 to Dunkeld at 55 m.p.h. Although it was now 7 o'clock, and there was a brilliant moon, it was pitch dark going through the woods and cuttings; all one could see ahead was the drifting steam from No. 2805 lighted by the fire, which looked like great tongues of flame. For a few moments it was inexpressibly weird. Then we swung through Dunkeld, 15½ miles from Perth, in 22¼ minutes, and were soon out in the open of the Tay Valley. For nearly 10 miles here the line is practically level and, with No. 5086 notched up to 20 per cent., speed rose to 62 m.p.h. By Dalguise 3¼ minutes had been regained, but then we had to make a special stop at Ballinluig, 23½ miles from Perth.

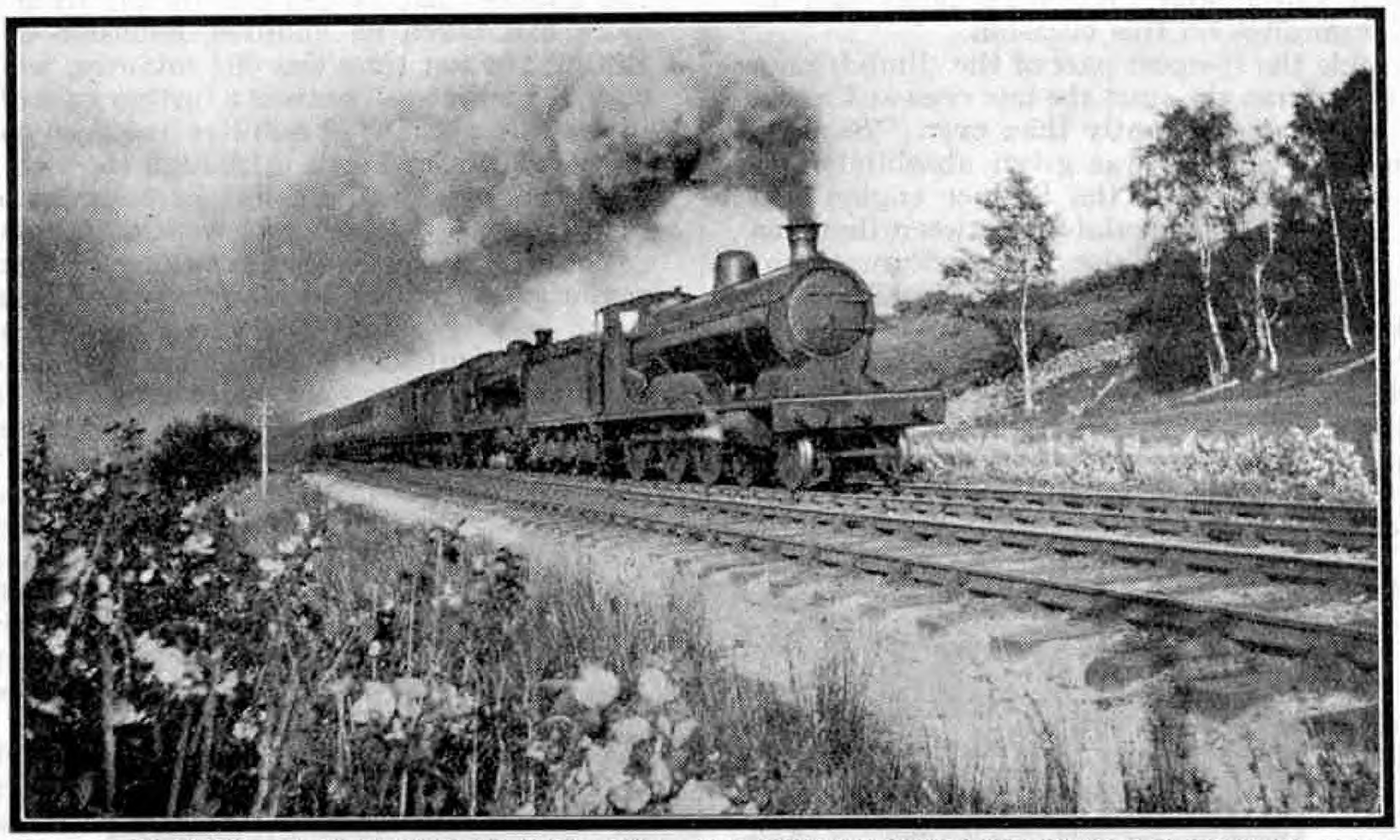
Climbing at 1 in 100, the two engines got their big train under way in good style, only to have to stop again at Pitlochry, five miles farther on and right in the middle of a 1 in 85 bank. The 28½ miles from Perth had taken 41¾ minutes, a very smart time, including as it did the stop at Ballinluig. Now in the beauty of a cloudless dawn we climbed into the Pass of Killiecrankie. In the narrowest part of the defile the railway crosses a tributary of the River Garry on a high viaduct, the hillsides are densely wooded, and high on the right there is a glimpse of Ben Vrackie. Once into the pass the line becomes level, and after we had exchanged tablets at Killiecrankie station speed rose to 46 m.p.h. before the stop at Blair Atholl. The 35¼ miles from Perth had taken 54½ minutes against a schedule of 53 minutes. This latter is for a



non-stop run; our engines, having to make intermediate stops at most difficult locations, had done well indeed to lose but 1½ minutes. The net time was only 47 minutes, a gain of six minutes on schedule.

Now there began the Druimuachdar tug-of-war. The first 4½ miles to Struan, although rising chiefly at 1 in 80, include some short level stretches, but beyond that station come a solid 11 miles almost entirely at 1 in 70. We got away in magnificent style, touching 41 m.p.h. at Struan; but then, with 40 per cent. cut-off and full regulator, speed settled down to a steady 26 m.p.h. up *"The Hill,"* as the enginemen call this bank. In the meantime the scenery was becoming majestic indeed. In the half-light before sunrise the Atholl hills deep in snow gleamed phantom-like against the pale blue sky; as we mounted, the cuttings became flecked with snow, above which the dead bracken rose golden brown.

Higher and higher we climbed up the western side of the broad strath, snow fences protecting the track at exposed places. Then, after rounding a shoulder of the great hills on our left, we turned into the narrowest and wildest part of Glen Garry. The snow lay deep here, the river was a raging torrent; but under a cloudless sky it made a picture of astonishing beauty. All the time the speed remained absolutely steady at 26 m.p.h. Despite this long "grind" on a fairly long cut-off No. 5086 was steaming very freely, in fact the needle seemed a fixture at 225 lb. per sq. in.



The upper illustration shows L.M.S.R. No. 14675, "Taymouth Castle," the first engine of the class to be built. In the lower photograph appears an up Inverness express near Daviot hauled by No. 14764, "Clan Munro," with No. 14691, "Brodie Castle," as pilot. The train includes portions for both Euston and King's Cross.

We were now approaching the dreaded Southern County March. Here the line crosses from Perthshire into Inverness-shire, and this desolate spot at the head of Glen Garry has been the scene of some terrible snow blocks. To-day all is fair—as yet—but both our engines were fitted with small snow ploughs in readiness for any emergency. Now the glen opened out on the left revealing Loch Garry, half frozen over, lying amid the gleaming white hills; we breasted the summit of the worst part of the bank, rapidly accelerated to 41 m.p.h. through Dalnaspidal, and so came into the Pass of Druimuachdar. We were among the giants of the Grampians. Every peak in sight was nearly 3,000 ft.; Ben a'Chaoruinn and the Boar of Badenoch towered on either side of the line, and a wild corrie on the left gave a glimpse of Brauch nan Iomairean and Ben Udlaman. It was an amazing sight to see range upon range of peaks all spotless white; but now heavy clouds were racing across the sky, and there was every sign of rough weather ahead. We took the last mile at 1 in 78 in our stride at a minimum of 39 m.p.h. and so crossed the highest railway summit in Britain, 17½ miles from Blair Atholl, in 36 minutes.

The regulator was quickly brought back to the drifting position, but cut-off was increased to 45 per cent. Had the engine been notched up to 15 or 20 per cent. we should doubtless have attained a very high speed down the steep descent into Strath Spey, but the curves make this out of the question. Using a long cut-off passes a large volume of low-pressure steam through the cylinders and gives a certain amount of cushioning action. The engine in consequence runs at a good steady speed without racing away and needing many brake applications. We worked up to 69 m.p.h., but as we neared Dalwhinnie the sky grew dark, bleak Loch Ericht away on the left was the colour of lead, and we were soon running in the teeth of a blizzard. The visibility was not more than a hundred yards at times, and speed was much reduced; ice packed up against the cab glasses, and the whole landscape was obscured in a flying welter of sleet and snow. Nevertheless we reached Kingussie, 36¼ miles from Blair Atholl, in 57¾ minutes, a further gain of 3¼ minutes on schedule.

Despite the storm we got away again in good style and then quite suddenly ran into clear weather. While the engines were working up to a very lively sprint, the pine forests of Rothiemurchus and the Cairngorm Mountains away to the right looked superb in the early morning sunshine. We touched 65 m.p.h. beyond Kincraig and completed the 11¾ miles from Kingussie to Aviemore in exactly a quarter of an hour—a still further gain of 2 minutes. At Aviemore, this spirited pair of engines came off, having regained no less than 11¼ minutes of lost time.

The load was now reduced to 401 tons tare and 430 tons gross, and our fresh engines were No. 5163, another Stanier 4–6–0, piloted by a Highland 4–6–0 of the "Castle" class built as long ago as 1902; this was No. 14682 *"Beaufort Castle."* I rode on the footplate of this veteran for the first part of the run, and a highly interesting experience it proved. The cab seemed very cramped after that of the spacious Stanier engine; a tarpaulin sheet was stretched from the roof to the tender to provide some additional protection, and it was an unusual thing in these days to look ahead over the top of the boiler through circular windows. The regulator is of the double-handle type, like that of a Great Northern "Atlantic," only much shorter; but the most interesting feature of these engines is the steam reversing gear. When the driver wishes to notch-up he operates a lever like a small regulator, steam is applied to the gear, and the pointer that indicates the cut-off slowly moves back on the scale. As soon as the desired position is reached steam is shut off. This arrangement enables quite fine adjustment of cut-off to be made.

Driver McLeod and Fireman Robertson of Aviemore shed were in charge, and after the first dozen yards or so cut-off was brought back

to 40 per cent.; the regulator was gradually opened to five-eighths and we got away in fine style. *"Beaufort Castle"* quickly developed a full-throated roar that completely drowned the exhaust of the train engine. Climbing at 1 in 150 speed rose to 43 m.p.h., but three miles out the gradient steepens to 1 in 75; McLeod opened the regulator still wider, and we went up at 33½ m.p.h. Our 430-ton load would be divided roughly in the proportion of 180 tons to the "Castle" and 250 to the Stanier, so that this was first-class going on such a grade. Just before Carr Bridge there is a slight dip, but unfortunately we had to stop at the station in order to cross the 8.30 a.m. up express from Inverness, the 6¾ miles from Aviemore having been covered in 12 minutes start to stop.

In the ordinary way these two trains pass each other at Slochd summit while the mail is detaching its pilot, but as we were running late we were stopped at Carr Bridge rather than hold up the other train at the summit. This incident shows up clearly the difficulty of working a long single line, for unless both up and down trains are punctual and cross at their scheduled places, simply chaotic delays can occur. It is for this reason that the difficult section between Blair Atholl and Dalwhinnie, over Druimuachdar summit, is double-tracked throughout. We were lucky not to be held up more than five minutes on this occasion.



A Highland goods train approaching Blair Atholl. The engine is 4-6-0 No. 17920 of the "Jones Goods" class, one of which is shown on page 273 as now preserved and repainted in H.R. colours.

As a result we had to tackle the steepest part of the climb from a dead stop. For nearly 2½ miles from the start the line rises at 1 in 60, but the two engines climbed more brilliantly than ever. *"Beaufort Castle,"* still with 40 per cent. cut-off, was given absolutely full regulator, and I learnt afterwards that the Stanier engine was working on 45 per cent., also with full regulator. Between them, as might be imagined, they made a terrific noise. The performance of the "Castle" under such strenuous conditions was really most impressive. She rode very smoothly, without any of the side-to-side surging often experienced on old engines, and to the accompaniment of a steady, even, thunderous beat. Speed rose to 25½ m.p.h. on the 1 in 60, and as we swung round into the fastnesses of the Monadhliath Mountains and the grade eased slightly to 1 in 70, we quickly attained a full 30 m.p.h.

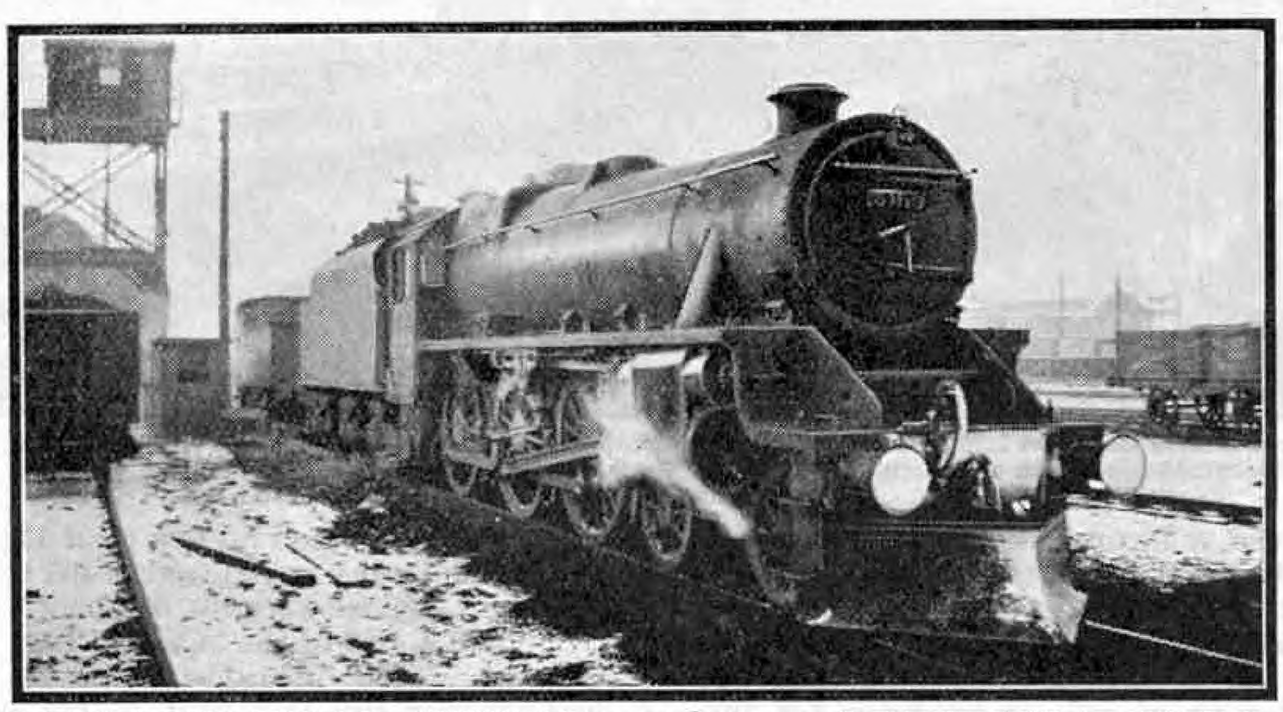
As we approached the Pass of Slochd Mhuic the wind caught us viciously, snow was driving again, and this time right through the cab; but speed was steadily maintained to the summit, 1,315 ft. above sea level. The 5½ miles from Carr Bridge had taken exactly 13 minutes start to stop—a very fine effort indeed. Here the pilot came off. Slochd is a desolate place even on the brightest of days, but with the wind screeching through the pass and sleet driving well-nigh level I was glad indeed to get into the shelter of the cab of No. 5163. This engine was manned by another Aviemore crew, Driver Munro and Fireman Malcolm.

In the remaining 22½ miles to Inverness the line descends 1,300 ft., but the very steepness of the gradients call for skilful enginemanship in order to maintain a good steady speed. Driver Munro worked No. 5163 in almost full forward gear, about 70 per cent. with the regulator closed practically the whole way. Descending at 1 in 60, we passed Tomatin, 3½ miles from the top, in 4¾ minutes, after a thrilling passage over the Findhorn viaduct at 63 m.p.h. This is a very graceful steel structure of nine spans that carries the line 140 ft. above the river; approaching from the south, its general lattice work was vividly silhouetted against the snowy hillside, producing a remarkably striking effect.

We covered the more undulating stretch of line between Tomatin and Daviot at a good 50–55 m.p.h. and then began the tremendous final descent, which is almost entirely at 1 in 60. From Daviot onward this section, which is the terror of up expresses, is double-tracked. Running once more in driving snow, we kept up a steady 60 m.p.h., crossing the great 29-arch viaduct across Strath Nairn, and so past Culloden Moor with its memories of the 1745 Jacobite rebellion. Far below, the Moray Firth could be seen vaguely through the snow, but soon we were approaching its shores; the line from Forres and Aberdeen joined at Millburn Junction and Inverness lay ahead. The 22 miles from Slochd to Millburn had been run in 25½ minutes.

Inverness is a unique station in that all the principal expresses are backed in. It is built in the form of a triangle, and in order to connect easily with trains for the far north, expresses from the south are run round the direct line to the north of the station and then backed into the northbound platforms. In our case there were connecting trains for Wick and Thurso, and Kyle of Lochalsh. We stopped at Rose St. Junction in 27¼ minutes from Slochd, and in another two minutes had backed into the platform. The 35 miles from Aviemore had taken 63 minutes, inclusive of the extra stop at Carr Bridge; the net time was 60½ minutes, while the running time was only 53¾ minutes. This was a further gain of 2½ minutes on schedule, so that altogether 13¾ minutes had been gained by the locomotives on the run from Perth. Although the two pilot engines had pulled their full weight, the principal honours rest, of course, with the Stanier 4-6-0s, both of which were loaded practically up to maximum.

The wintry weather was causing the operating officials at Inverness a good deal of anxiety, and one of the first questions we were asked on arrival was how things were "on top"—this referring to Slochd summit. On hearing what we had come through, the shed foreman remarked: "We shall have to get the snow ploughs out." At times such as this, there is no waiting for a block to occur before the ploughs are sent out. All the danger points are patrolled incessantly by light engines fitted with the small type of ploughs such as those that were carried by our engines on this trip. But such is Highland weather in the winter that even this precaution does not prevent drifts forming sometimes; a sudden change in the wind and a heavy squall may very quickly block the line. It is then that the monster ploughs are set to work. These are nothing more than enormous shovels on four wheels, and they are pushed by two or even three engines. With one of these implements snow lying two or three feet deep can easily be cleared, but in the Highlands a drift 10 or 12 feet deep may be formed in a single night. Forcing a way through this is one of the most thrilling and terrifying operations imaginable. The snow plough with its three engines retreats to a distance of about a mile, or even more; and then, the engines going absolutely "all out," charges full speed into the drift. Snow is hurled 30 or 40 feet into the air, and it often takes two or three "charges" to clear a bad drift.



L.M.S.R. 4-6-0 No. 5160 of class "5P5F" at Inverness. It has a small snow plough fitted, and the frozen snow on the buffers and buffer beam shows that it has encountered rough weather on the way.

Although a mere trifle compared with such conditions as these, No. 5163 on arrival at Inverness bore unmistakable evidence of the weather we had come through. The buffer beam and snow plough were coated with frozen snow, and the carriages had a distinctly Arctic appearance! Thus finished a journey that, for fine running and all-round interest, would take some beating.

Facts about British Railways

A Progressive Transport System

NATIONAL prosperity depends, as Francis Bacon truly stated, on the "easy conveyance of men and commodities from place to place"; in other words a thoroughly efficient transport system is a vital necessity to a country. British railways provide such a system for us, and we in Britain are fortunate that we have the best and safest railway system in the world at our command.

In an age of motor and air traffic people are apt to take railways for granted, until it is realised how necessary they are and what a huge concern the railway industry is. It represents the largest private undertaking in the land, with an invested capital of £1,092,517,000. The railways are Britain's best customers, for they purchase annually a tremendous amount of material, both finished and in the raw state. They are necessarily great employers of labour. The staffs of the four railway groups number 554,296, and railway requirements give employment indirectly to thousands of others.

Both collectively and individually British railways hold world's records in several respects. The fastest long-distance train in the world, over a journey of more than 200 miles non-stop, is the streamlined *"Silver Jubilee"* operated by the L.N.E.R. It averages 70.4 m.p.h. over the 232.26 miles between King's Cross and Darlington, as part of its journey from London to Newcastle-on-Tyne. The world's longest non-stop run is made by the L.N.E.R. in summer, *"The Flying Scotsman"* then making the 392.7 miles without a halt between King's Cross and Edinburgh; during the winter the record is held by the L.M.S.R. with the up run of *"The Royal Scot"* over the 299 miles from Carlisle to Euston, a service that is maintained all the year round. A world's record also is held by the S.R. in the extent of its suburban electric train service.

British railways collectively are the largest owners in the world of docks and of hotels. They are Britain's largest owners of motor vehicles and they are the largest household removers in the country. They have 6,754 passenger stations and between these there were made last year 1,155,457,000 journeys. The standard of safety on British railways is so high that the chance of the individual traveller meeting with a fatal accident is one in 89 million! In 1935 freight tonnage amounted to 261,241,000 and the total mileage of passenger and freight locomotives reached 560,983,000.

To carry the traffic there are 43,001 passenger coaches capable of seating 2,495,000 people at once; 17,464 brake, parcel and mail vans and similar vehicles and 7,236,000 railway-owned freight wagons. To haul them there are 20,165 steam locomotives. There are also 100 steam rail motors, 1,507 electric motor coaches, and 14 oil-engined units. There are 15,000 passenger motor vehicles in which the railway companies are interested, 8,333 railway-owned road motors for goods and parcels, 25,904 horse-drawn vehicles, and 13,247 horses. Railway steamers number 140 and they have a total gross tonnage of 182,573.

There is a total railway mileage expressed as single track and including sidings of 50,711, of which 1,544 are electrified. The smoothness of British railway travel is proverbial and is largely due to the excellence of the permanent way. To control the trains there are 10,435 signal cabins.

British railways realise that public requirements are constantly changing, so that it is necessary for their transport methods to show continual progress. Wider travel facilities are now available than ever before. It is possible even to obtain cards for stamps in order to save up by degrees for one's holiday journey. The service of meals on trains is an accepted feature of modern travel. Improved standards of design and comfort are constantly being introduced in new passenger rolling stock.

On the freight side British railways are now in the unique position of being able to supply all the numerous and varied services which traders require whether these are by rail, road, water or air. "Next morning" deliveries are a feature of the services afforded by the 600 express freight trains that run regularly between the important centres of population. Systems of registered transit are available whereby consignments of any size are delivered in accordance with a pre-arranged schedule. Special vehicles are in service for the conveyance of the numerous and varied loads that the railways, as common carriers, have to deal with. Terminal facilities have been greatly improved during the recent years and large sums have been spent on stations, sidings and docks. There are railway warehouses at all large centres where traders can rent space for the storage of their goods. In rural districts there is a completely organised system of motor lorry services operated from 1,750 railway stations, to link up outlying villages with local railway centres.

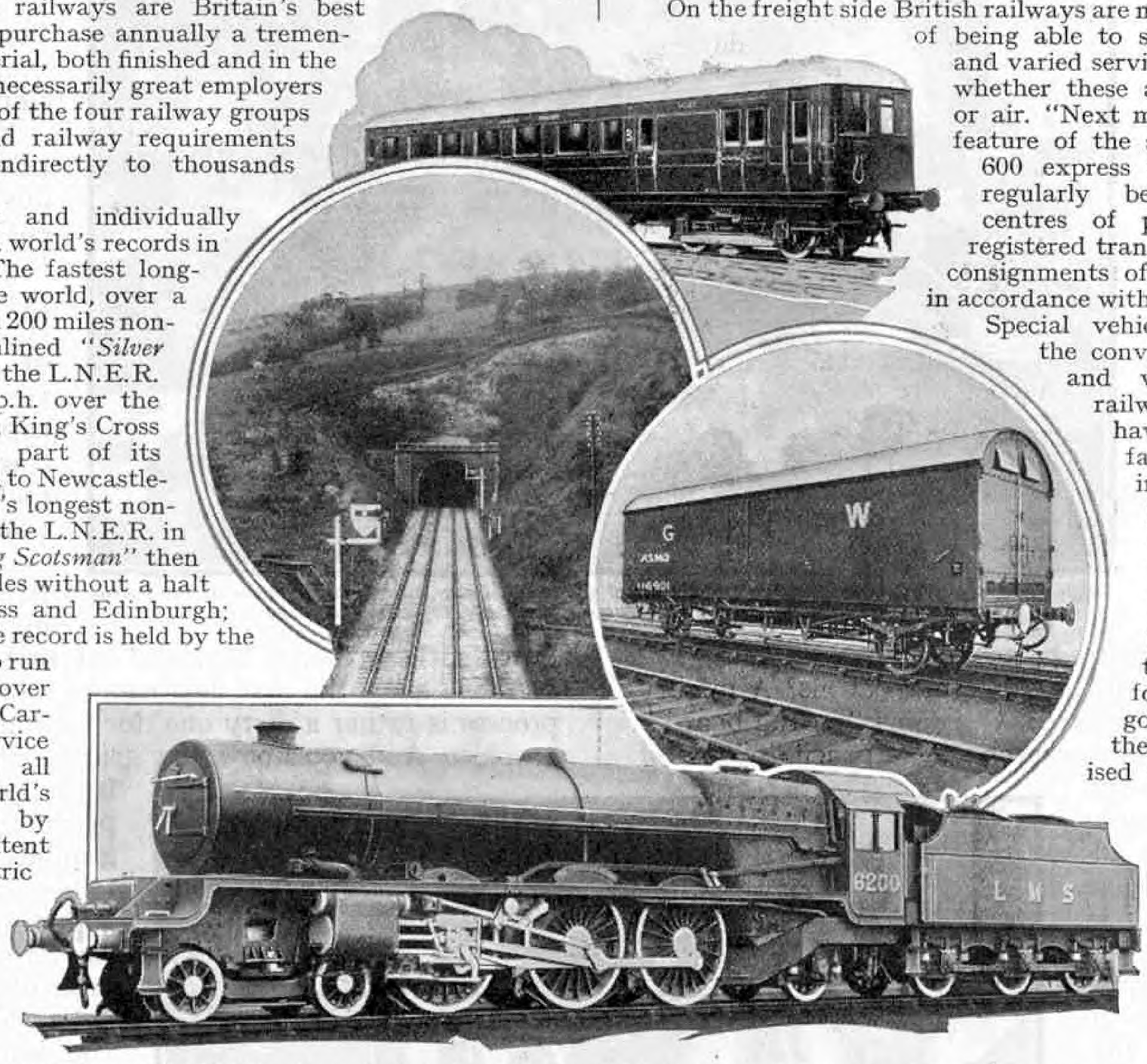
In order to take the fullest advantage of modern motive power considerable improvements have been, and are being, effected at locomotive depots. These include facilities for the rapid handling of engines, and the installation of mechanical coaling and ash disposal plants, larger turntables and water softening installations. Last year saw the introduction of the first streamlined locomotives in this country, also the first turbine-driven locomotive to be built in a British railway works.

Streamlined heavy-oil rail cars are in use on the G.W.R. Experiments are in progress with Diesel and Diesel-electric locomotives and there are 14 Diesel-engined rail cars in service.

Railway docks, harbours, and wharves are situated at 77 places. They include the world's largest graving dock, at Southampton, a port used by over 30 of the largest shipping companies in the world.

Air services are now operated by British railways in association with Imperial Airways Ltd. During 1935 there were 42 services in operation daily, and these covered more than 6,000 miles every week day during the summer months.

The interesting items mentioned in this article, and many others, are included in the booklet *"Facts About British Railways"* (1936), which is obtainable free on application from the British Railways Press Office, 35, Parliament Street, London, S.W.1.



Typical examples of British railway stock, track and equipment. The top illustration shows an S.R. electric motor coach. Below it is seen the mouth of Cowburn Tunnel, L.M.S.R., and a G.W.R. motor car van. The locomotive illustrated is L.M.S.R. No. 6200 "The Princess Royal."

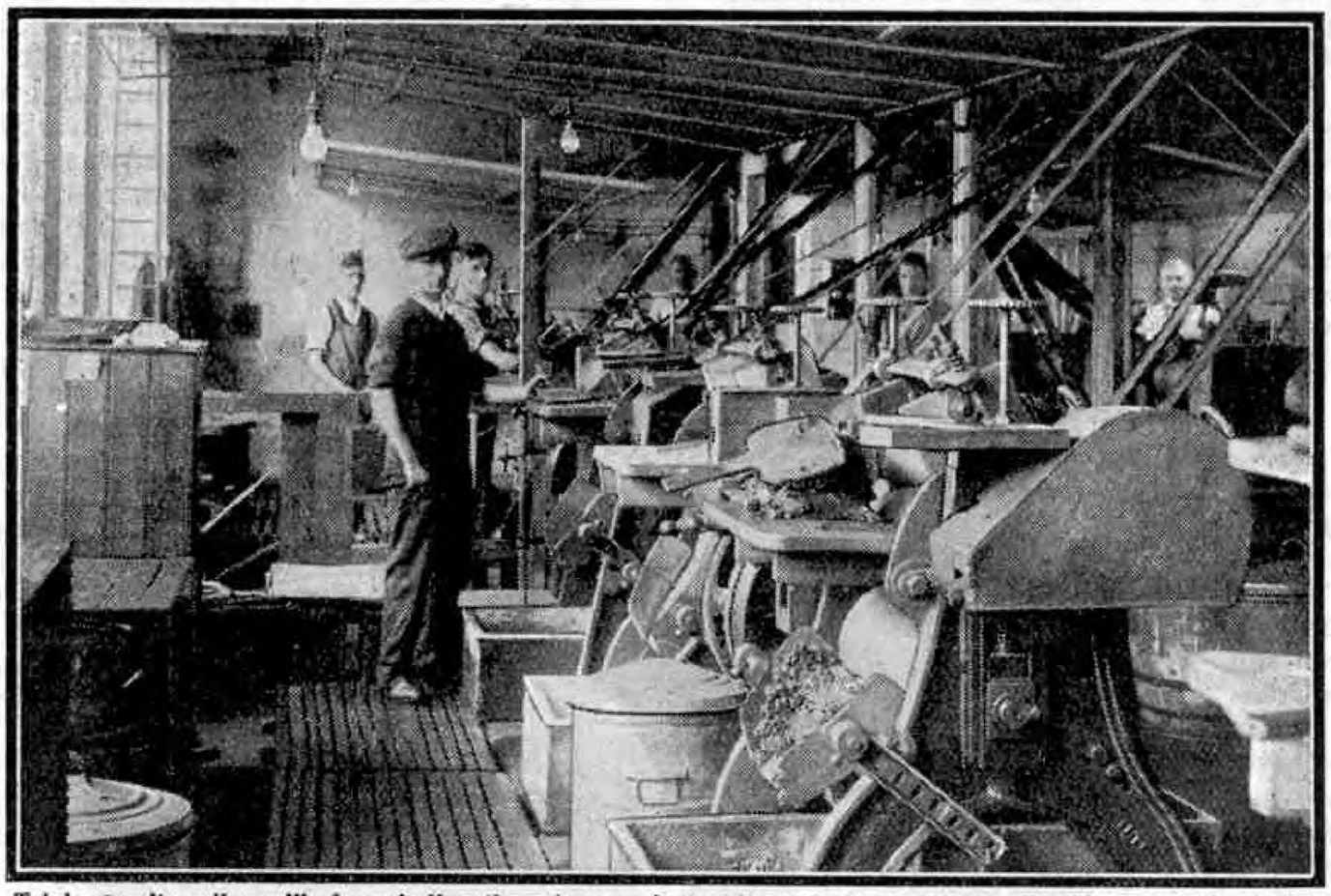
"Now Let's Draw a Train!"

The Life Story of a Pencil

By J. F. Chambers

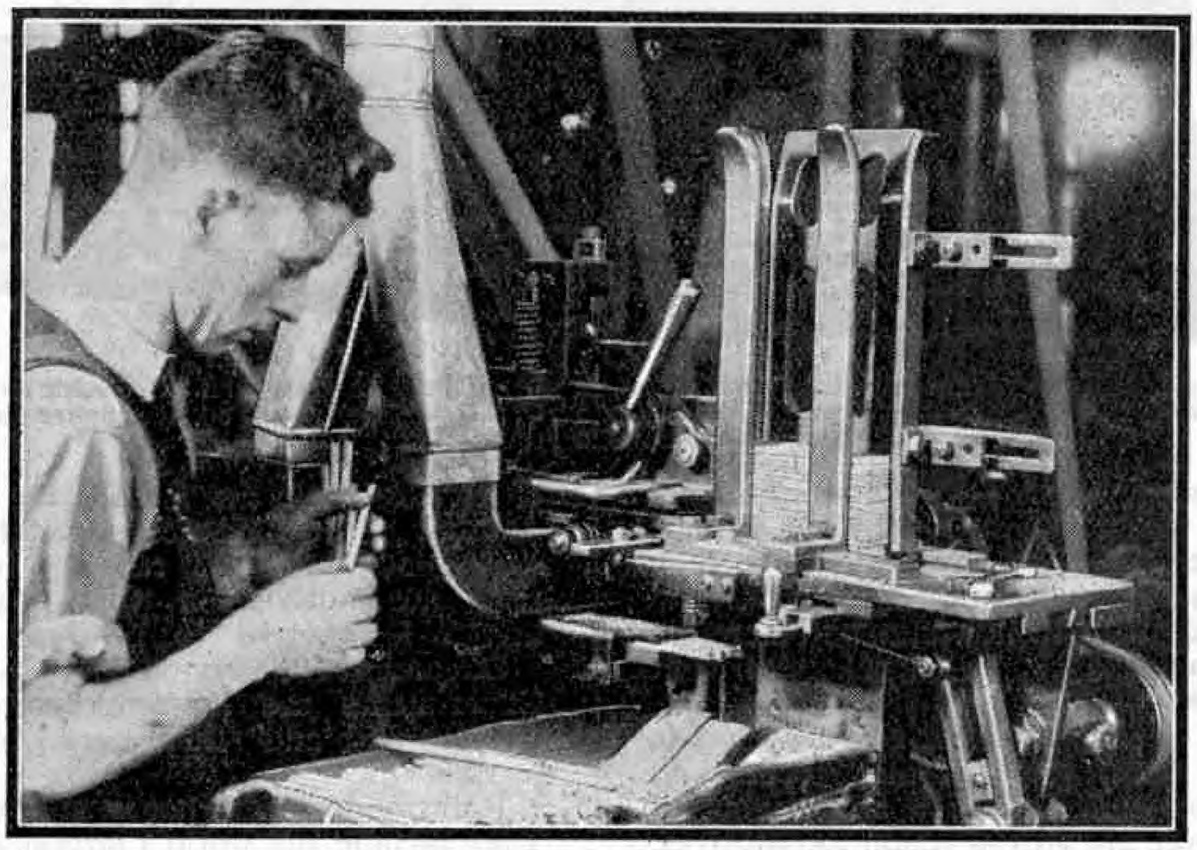
SOME of you will smile as you read the headline, and say to yourself: "Kid's stuff!"

But all of us had to learn to draw and to write when we were very young. It's a sort of craving, this wish to put our thoughts down. Even primitive men drew stories of adventures with wild animals, and you can see their crude drawings still, thousands of years old, on the walls of caves. They drew with bits of bone and flint, just as the Egyptian drew his "cuneiform" lettering with a stylus on clay bricks, which were afterwards baked hard. So next time you jot down something in pencil, remember that writing wasn't always so easy as you find it to be to-day!



Triple granite roller mills for grinding the mixture of graphite and clay used in making pencils. The photographs illustrating this article are reproduced by courtesy of F. Chambers and Co. Ltd.

Have you ever thought much about pencils? A mighty locomotive like the "*Silver Link*" begins "on the board," as the draughtsmen say—sketched "in pencil." Some of the cleverest drawings and the most thrilling stories and the most telling advertisements start as an idea dotted down "in pencil." A boy scrawls with one in his first year at school, and goes on using pencils all his life. So you can imagine that making pencils, which is my job, is pretty interesting.



A machine that in one operation divides the slats containing the leads into six complete pencils and gives each of these the exact shape required.

People still call them "lead pencils," but the one the butcher's boy carries behind his ear, or the artist uses, is not made of "lead" at all. Originally the metal lead was used in crude pencils, but about 1564 a substance called "graphite" was discovered, in Cumberland, which was just right for making a mark with. Later, less than 100 years ago came the discovery that led to the birth of the pencil as we know it to-day. It was found that if graphite is ground up very fine, and mixed with a special clay, it can be "extruded," or squeezed out through a nozzle, just like squeezing toothpaste from a tube. It comes out as a thin stick or thread, and can be cut into lengths. Artificial silk threads are made in just the same way.

Well, I think we're just about ready to start our tour of the Pencil Works at Stapleford near Nottingham.

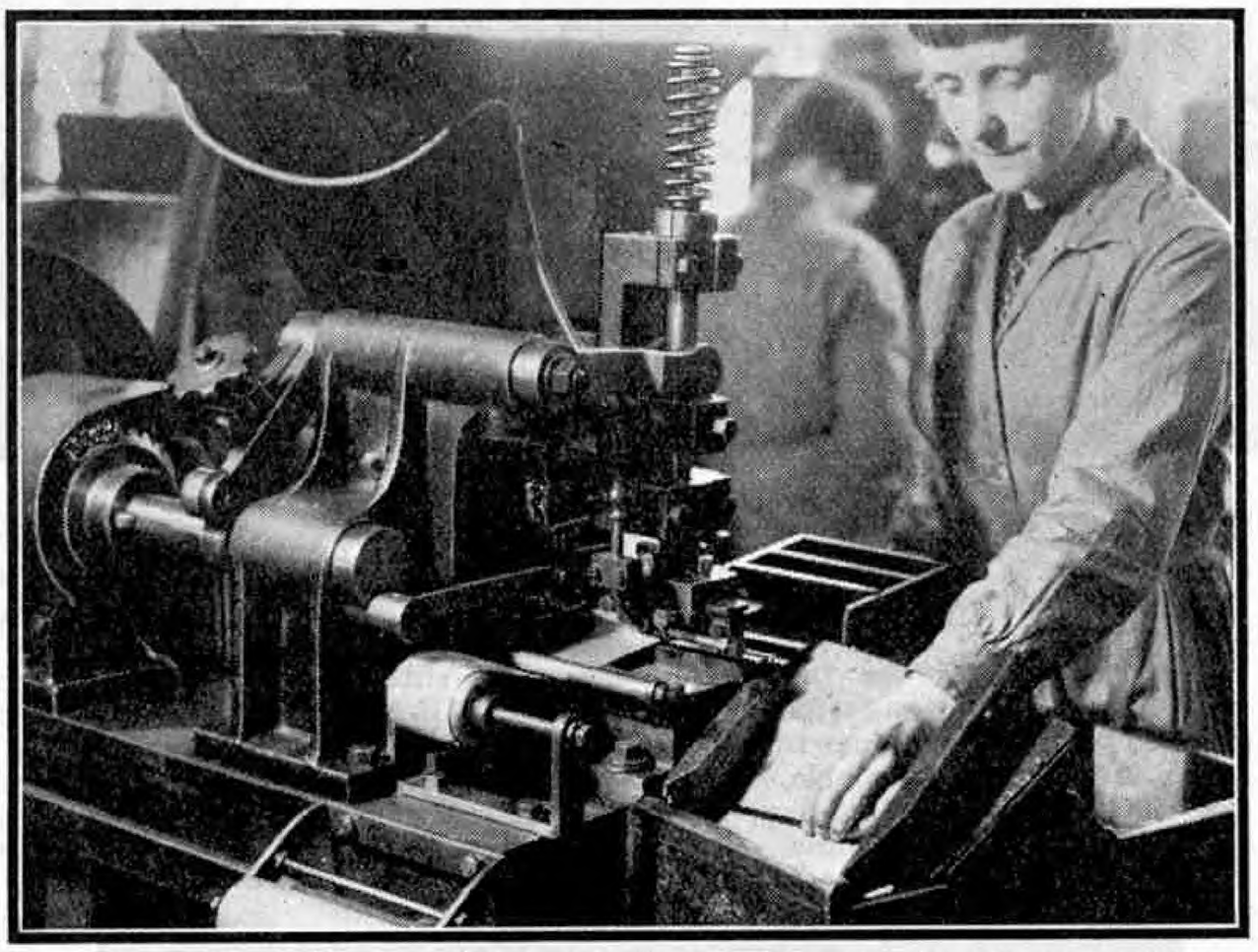
You would be surprised at the tremendous number of different pencils we make. Besides the ordinary pencil in every quality and degree—from 6H, very hard, to 6B, very soft—there are copying ink pencils, cosmetic pencils for make-up purposes, coloured pencils for marking goods and parcels, and advertising pencils of every kind, with messages stamped on their sides.

As we enter the first department, you will see that the process is rather a dirty one, for men are grinding up the graphite. And you know how grubby your fingers can get from even one soft lead pencil! The powdered graphite is ground up by triple granite rollers, together with the washed clay, to a marvellous degree of fineness. This is done very carefully, for you know how annoying it is to "strike a bad patch" in the lead of a cheap pencil.

When the grinding process is complete, the graphite mixture has most of the moisture extracted, and is made into cylindrical cakes about 3 in. across and 6 in. high. These fit into the machines that extrude the lead. A ram squeezes out the mixture under enormous pressure, and the thin leads, or "slips" as they are called, come out of holes in a metal plate. Sometimes as many as 16 come out at once, and when they are the right length a girl dexterously snips them off and catches the slips on a grooved board.

At this stage the leads are still soft, and can very easily be broken in the fingers. So when dry they are taken away to be baked hard, and become the pencil-leads as we know them.

Thousands of carefully examined leads are packed into clay boxes or "seggars." A layer of powdered graphite is put on top to exclude the air, a clay lid is dropped on, and several boxes are then put in special ovens at a very high temperature. After baking, the slips are tested for strength, degree, and quality. In fact, at every stage of manufacture the inspection is very strict, so strict that only 2 per cent. of our pencils are rejected as faulty at the final inspection!

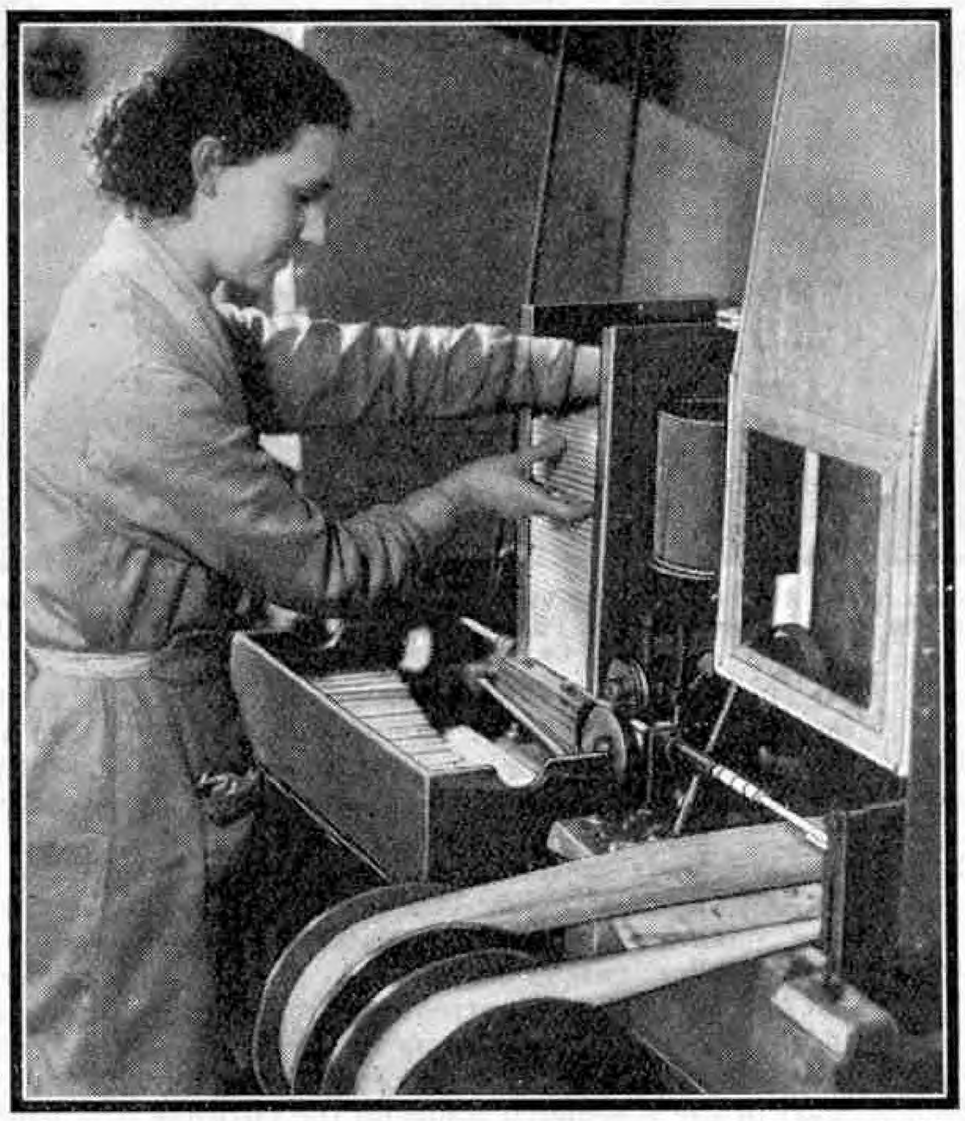


Stamping pencils with the name of the makers. The illustration shows the roll of metal foil that passes between the pencil and the stamping die.

While the slips are being made in one part of the factory, the wood for the pencils is being prepared in other departments.

We are very proud of our pencil-wood at Chambers'. It is Empire Cedar, grown in British East Africa. Although it is the ideal wood because of its uniform texture, even grain, softness for easy sharpening, and good colour, everyone used to say it was no good for pencils because it warped. We were not satisfied to leave it at that, and experimented again and again until we invented a secret way of seasoning the cedar wood so that it *won't* warp! I can't tell you how it's done—but the Government know it is a sound process, for all the pencils they buy are now "Empire Cedar"!

The wood comes to Stapleford from Africa in slats of suitable size, and after seasoning by our process the slats have circular grooves cut in one side, just half the diameter of a "slip." A clever little machine cuts perhaps six of these grooves at once, quick as lightning, and each groove is exact to a thousandth of an inch. The slats are next coated with glue on the grooved side, the slips are laid in, another slat is clapped on top, and then these are clamped together for the glue to set. Even the gluing is automatic.



Painting machine hopper for pencils, which are automatically coated with cellulose paint and dropped on a travelling belt to dry.

Next an ingenious shaping machine takes off the surplus wood, shaping the pencils round, hexagonal, oval or triangular. It is very fascinating to see a chunk of wood put in one end, and six pencils, almost complete, drop out at the other!

After shaping, the pencils are again examined, cut to the standard length of 7 in., and then put through painting or polishing machines. The pencils pass at the rate of 140 a minute through a tank containing cellulose paint, out through a rubber nozzle to take off the surplus paint, and on to a travelling belt. They arrive at the other end of the belt dry and ready to handle.

Naturally the ends become coated with paint too, so the next thing is to sandpaper the end clean, in yet another automatic machine. Some of our pencils have the butt end covered in an attractive contrasting colour paint, and there is an interesting fact here. If you put the paint on, leaving the end "square," you can chip it straight off with your finger. But if the end is slightly rounded, the paint stays put! So there is another machine rounding the ends!

We have not spoken of the busy, dexterous fingers of men and girls, tending all these complex machines, manipulating thousands of pencils a day with incredible swiftness—that must be seen to be believed!

So here is our pencil, with good lead, wood that cuts easily right down to the stub, a nice shape to handle, pleasantly coloured red or yellow or something else. But it isn't finished yet. Here is a clever little machine, working on the principle of a printing platen, which prints our firm's name, in gold perhaps, through a constantly moving roll of special gold paper, on the side of the pencil. And on the other side another arm stamps, for all to see. "EMPIRE CEDAR."

Some pencils come to you unsharpened, but here is a marvellous machine sharpening pencils as fast as you can count. And every point is just the right shape, so that you can write straight away—the wood smoothed off perfectly so as not to gather dust while awaiting a purchaser in the stationer's shop.

And so at last we get to the examining department, where eagle-eyed girls get a handful of pencils, lay them flat on the bench, roll them to see if they are true, study them for faulty painting or printing, swoop on a "dud" and throw it out. Other girls are bundling pencils. They never count them, but just pick up a dozen by touch! A dozen is picked up, once round, twice round with the twine, knot, break off the end—as quick as a conjuring trick.

So that's how a simple thing like your pencil is made—the tool that writes stories, builds bridges and helps to run this wonderful world to-day.



Dock Scheme for Shanghai

A new £500,000 wharf that is being built just outside the harbour area of Shanghai, when completed will give this great Chinese port one of the finest dock systems in the world. The wharf forms part of a scheme to provide an uninterrupted dock frontage of 2,500 ft., the first section of which will consist of two 590 ft. wharves, a small jetty for tenders and Customs launches, and an up-to-date Customs building with rest rooms and a café.

The wharves will be equipped with the best modern mechanical devices for facilitating the rapid loading and unloading of ships, including elevating trunks, stackers, mobile cranes and gravity roller conveyors.

New Cantilever Bridge for Australia

It is expected that construction will soon be commenced on a great bridge over Brisbane River, Australia, between Kangaroo Point and Bowen Terrace, in Brisbane. This bridge will be of the cantilever type. It will have a channel span of 924 ft., with a width of 60 ft. between the trusses, and will cross the river at a height of 100 ft. above high water level. It will be provided with a roadway 40 ft. in width and two 10 ft. footpaths, but provision is to be made for a 60 ft. roadway and two 10 ft. footways when needed.

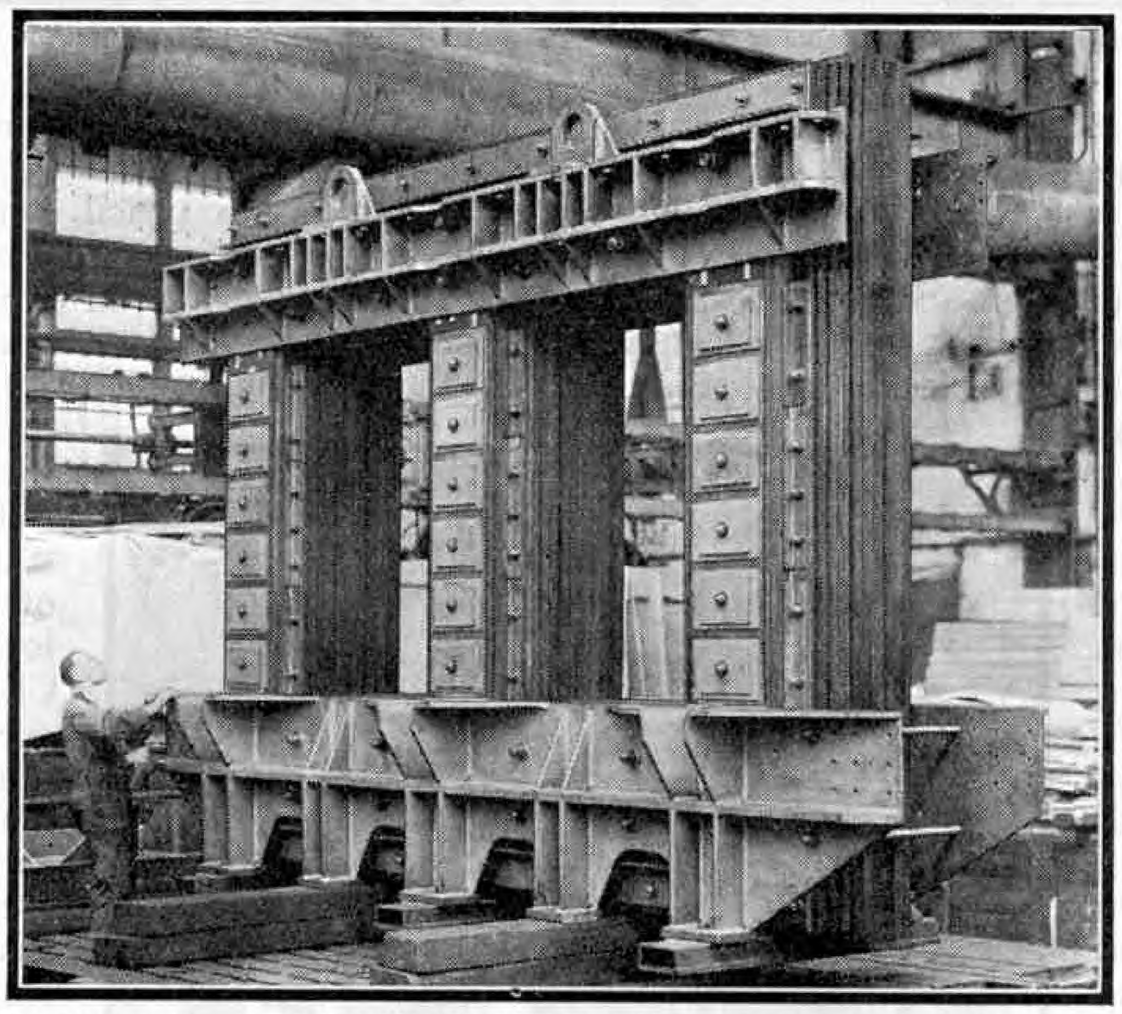
The channel span of the bridge will consist of two cantilever arms each 308 ft. long, and a central suspended span also 308 ft. long. The shore anchor arms on each side of the main piers are each to be 269 ft. 6 in. long. The piers will be constructed of concrete, and the roadway is to be of reinforced concrete 6½ in. thick, with a surface of 1½ in. of sheet asphalt.

A Giant Globe

Preparations are now in hand for the World Exhibition to be held in Paris next year, and a notable exhibit will be a giant mechanical globe, 43 ft. in diameter, that will depict the Earth's continents and seas on a scale of one to 1,000,000. On this miniature world tiny ships operated by means of concealed electro-magnets will sail along the principal trade routes, and replicas of famous volcanoes will be set in action by pressing buttons. The globe will be surrounded by a platform for spectators and will revolve on its axis, illumination being provided by an artificial Sun and Moon.

Removing 70,000 Tons of Silt Daily

A great water-treatment plant that will be the largest of its kind in the world is to be installed on the Colorado River for the purpose of removing silt from the water pouring into the new All-American Canal from the Imperial Dam. It will be capable of removing 70,000 tons of silt a day, and is to be constructed near Yuma, Arizona, about 250 miles below the great Boulder Dam.



The 55-ton core of a 75,000 kVA Met-Vick Transformer that forms one of two similar units for the Fulham Power Station. Photograph by courtesy of Metropolitan-Vickers Electrical Co. Ltd., Manchester.

The plant will consist of six huge settling basins, 769 ft. long and 269 ft. wide, with a depth of 15 ft. These will be arranged in pairs and each pair will be fed from channels that in turn will receive their water from the headworks at the Imperial Dam. The rate of flow to the channels will be regulated by four huge roller gates, each 75 ft. long and 23 ft. high. The untreated water will flow evenly and slowly across the basins, and in its passage will deposit the greater part of the suspended solids on the bottoms of the basins. The deposited material will then be removed by 72 mechanically-operated clarifiers, each 125 ft. in diameter, that will continuously manœuvre the accumulating material to outlets in the bottoms of the basins from where it will be discharged and returned to the Colorado River below the dam. The clarifiers will be the largest ever installed.

A Novel Drilling Tool

A novel method has been adopted in order to bore a number of 5 ft. diameter holes for concrete foundation shafts at the Fort Peck Dam in the United States. The cutting tool consists of a split circular pan, 5 ft. in diameter, that is fitted with two sets of tungsten carbide cutting teeth. The pan is attached to the lower end of a 50 ft. pipe shaft, and is rotated by a 40 h.p. electric motor attached to the upper end of the shaft and provided with the necessary reduction gearing. The cutter is suspended from the boom of a crane, and in operation it is lowered to the surface of the ground before the motor is set in motion. When a foot or more depth has been drilled the motor is switched off and the cutter is lifted by the crane, the excavated spoil being brought up on the pan. When clear of the ground the pan is swung to one side for dumping. A depth of about 5 ft. per hour can be drilled with this apparatus.

Automatic Telephone Developments

The distance up to which subscribers on automatic telephone exchanges in this country can obtain their own connections simply by operating a dial on their instruments is gradually being extended. In the near future it will be possible to put through calls over distances up to 15 miles without the intervention of an operator.

Another interesting development that was announced recently concerns an automatic time signal to indicate that the period allowed for a telephone call is approaching its end. This signal, which will be something like the B.B.C. time signal, is to be introduced in most parts of the country, and will operate automatically 12 seconds before expiry of each three-minute period. The new signal will be more accurate in timing than the present "three minutes" warning given by the exchange operator, and the caller will not be distracted from his or her business, as sometimes happens when an operator suddenly intervenes during a conversation.

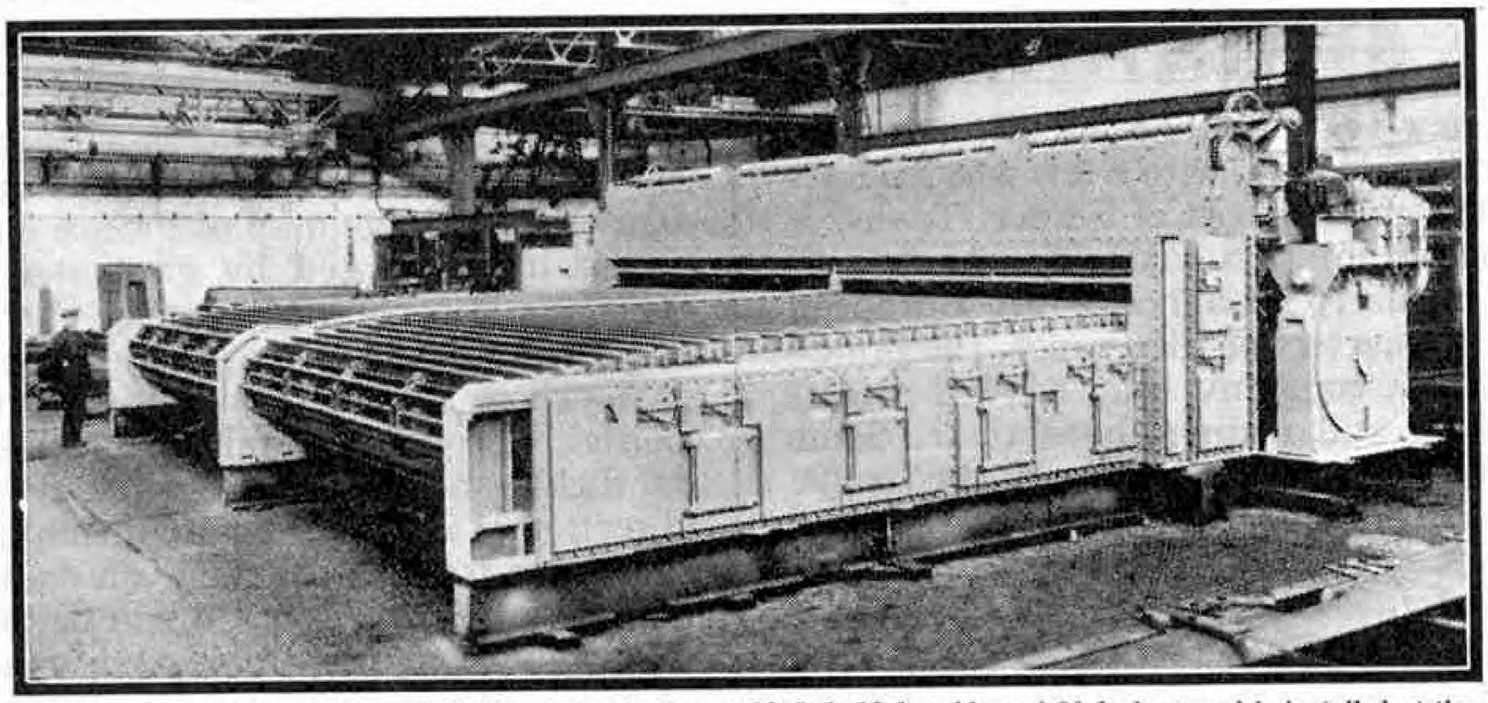
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A wonderful paper-making machine that weighs 2,000 tons and is nearly 500 ft. in length has been installed at Sittingbourne, Kent. It is capable of producing 2,500 miles of paper, 30 in. wide, a week, and is stated to be the largest in the world.

World's Largest Chain-Grate Stokers

The upper illustration on this page shows one of a set of eight travelling chain-grate boiler stokers that are the largest ever constructed. It was made by Babcock and Wilcox Ltd., for the Klip River electricity power house, South Africa, which is operated by the Victoria Falls and Transvaal Power Company Ltd.

These stokers are 33 ft. wide and 20 ft. long, and have approximately 20 per cent. more grate area than the world's next largest, which are installed at the Philo power station, Ohio. They are to work in conjunction with Babcock and Wilcox water-tube boilers, and are of the forced draught type with closed front, but the fronts and ashpit can be opened and natural draught reverted to if desired.



The largest travelling chain-grate boiler stoker in the world. It is 33 ft. wide and 20 ft. long and is installed at the Klip River Power Station, South Africa. Photograph by courtesy of Babcock and Wilcox Ltd., London.

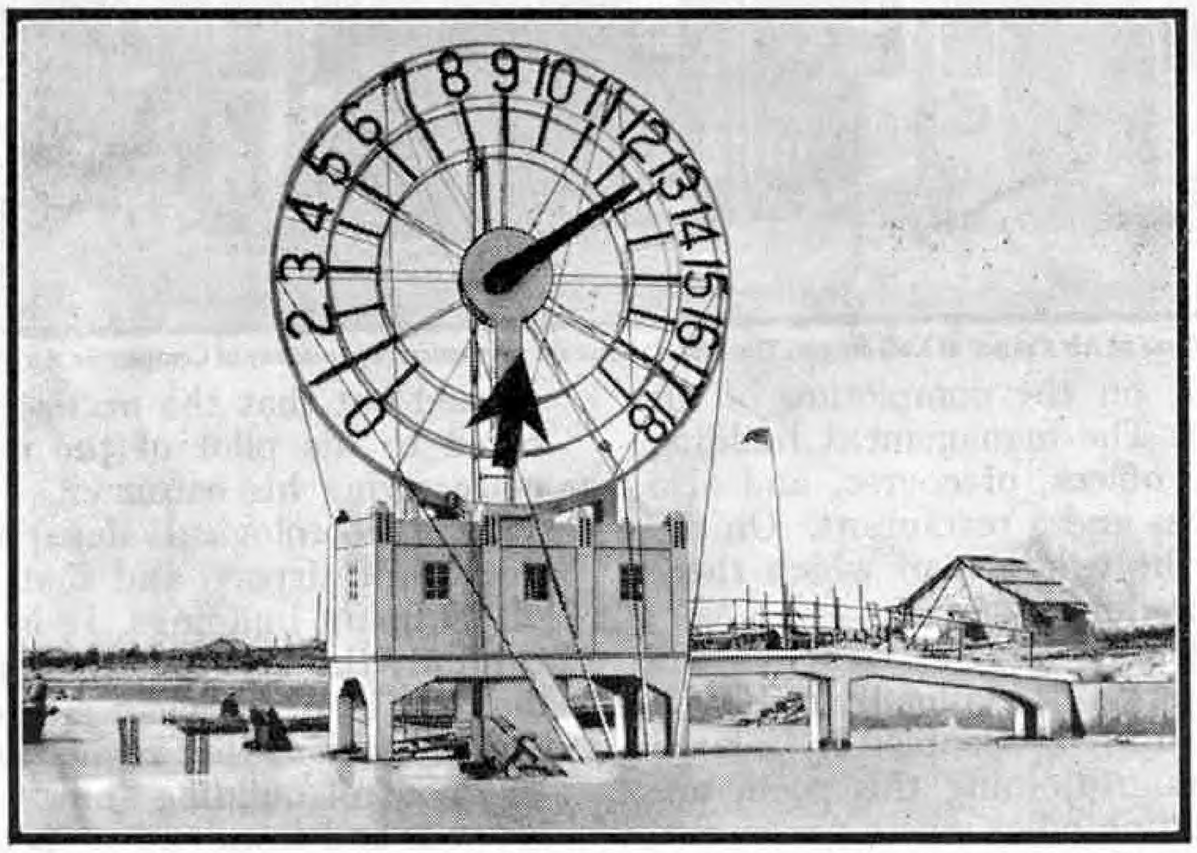
The forced draught is supplied from a duct below the boiler and passes through the slack side of the chain grate, so that it picks up the waste heat in the chain links on its way to the fire. Beneath the working side of the grate are transverse sheet metal troughs fitted with adjustable dampers for the admission of the draught, and they enable the supply of air to the fire to be regulated as required. Towards the back end of the grate there is a series of clinker bars, which rest on the grate and guide the clinkers into a hopper.

The stoker is driven by an electric motor through two sets of gearing, each of which drives one half of the width of the grate. The motor runs at a speed of 1,000 r.p.m., and the gearing enables the grate to be operated at speeds ranging from about 14 ft. per hr. to 68 ft. per hr.

Tide Gauge for Chinese River

The lower illustration on this page shows an interesting tide gauge that is installed at the mouth of the Whangpoo River, China, for the purpose of warning pilots of the state of the tide and the depth of water.

The gauge bears a large dial, on which a moving finger indicates the height of the tide in relation to the minimum depth of water, while a small arrow points either vertically up or down to show whether the tide is on the flood or ebb.



An interesting tidal gauge that is installed at the mouth of the dangerous Whangpoo River, China, to inform pilots of the depth of water available for navigation at various states of the tide. Photograph by courtesy of The Renold and Coventry Chain Co. Ltd., Manchester.

A feature of the operating mechanism is the use that is made of steel chain drive. To a float working in a chamber under the gauge house, is connected a length of Renold steel chain that passes up through the structure and over a head wheel, and is attached to a counter-balance weight. The chain engages with special sprocket wheels, and these in turn are connected by supplementary chain drives to the other sprockets, on the shafts of which the indicating finger and the arrow are mounted.

An advantage of chain drive over other forms of transmission is that it combines freedom from slip, which is characteristic of toothed gears, with the flexibility of ropes and belts. These features give it a very high mechanical efficiency which has led to its use for driving machinery of all kinds ranging from bicycles to giant newspaper presses and talking picture apparatus.

Amateur Navvies Make a Canal

A Canal three miles in length is being excavated in Bengal by the voluntary labour of 20,000 men of all social ranks, rich, poor, Government officials and coolies working side by side. They have undertaken the task because the local government have no funds for the work, which has become necessary owing to the fact that a canal which used to drain away rainwater from a large area in Tippera district has gradually silted up, with the result that after the rainy season flood water remains, to become a breeding place for mosquitoes.

As the local authorities could not afford to re-make the canal an appeal was issued by the public for help, and men from all classes of society volunteered.

* * * *

A new bridge is to be built over the River Towy at Carmarthen to replace the present ancient structure. The bridge is a link in the Fishguard to London trunk road.

New Thames Tunnel

It is expected that work on the new Thames Tunnel, between Dartford, Kent and Purfleet, Essex, will be started this year. The work will take about four years to complete and will cost nearly £4,000,000. In addition, important arterial highways are to be constructed to link the tunnel with existing traffic routes. The tunnel probably will be built at a depth of 40 ft. below the river, and the only point along the route where engineering difficulties are likely to be encountered is on the north side of the Thames, where special precautions will have to be taken because of the nature of the formation.

Materials for a Great Dam

An idea of the vast amount and variety of material that goes to the making of a great dam may be had from the following details of orders issued by the contractors who are responsible for the erection of the Grand Coulee Dam now being built in the U.S.A. The materials purchased up to date range in size from pins to giant excavators, and include 121 miles of sheet steel piling weighing 12,600 tons, 30 steam hammers, 1,000,000 ft. of board timber, 4,500 tanks of oxygen and acetylene and 1½ miles of steam piping. The amount of calculation work involved on such a job is tremendous as is indicated by the fact that 10,000 pencils have been bought and used to date.

Finding Lost Pipelines

A new magnetic detector of great sensitivity has been produced in the United States for discovering the lost course of a gas or water pipe. The instrument is a surveying compass with an adjustable bar magnet, and fixed to the compass box and turning with it are two radial fins made of magnetic material, which serve as a magnetic aerial and effect a substantial increase in sensitivity.

When searching for a pipeline electric current from dry cells is sent through the pipe by making contact with its ends, an ammeter being included in the circuit. The detector is then set up at a point known to be on one side of the pipeline and the compass box is turned so that the fins are at right angles to the line. The bar magnet is then adjusted to give the necessary degree of sensitivity and to give the needle the same general bearing as the line. The detector is moved from place to place across the supposed line of the pipe and a graph curve is then plotted showing changes in current indicated by the ammeter as the detector is moved. The point directly below the peak in the curve indicates the position of the pipe.

The detector has been used successfully to locate pipes 7 ft. below the ground.

Le Bourget Airport

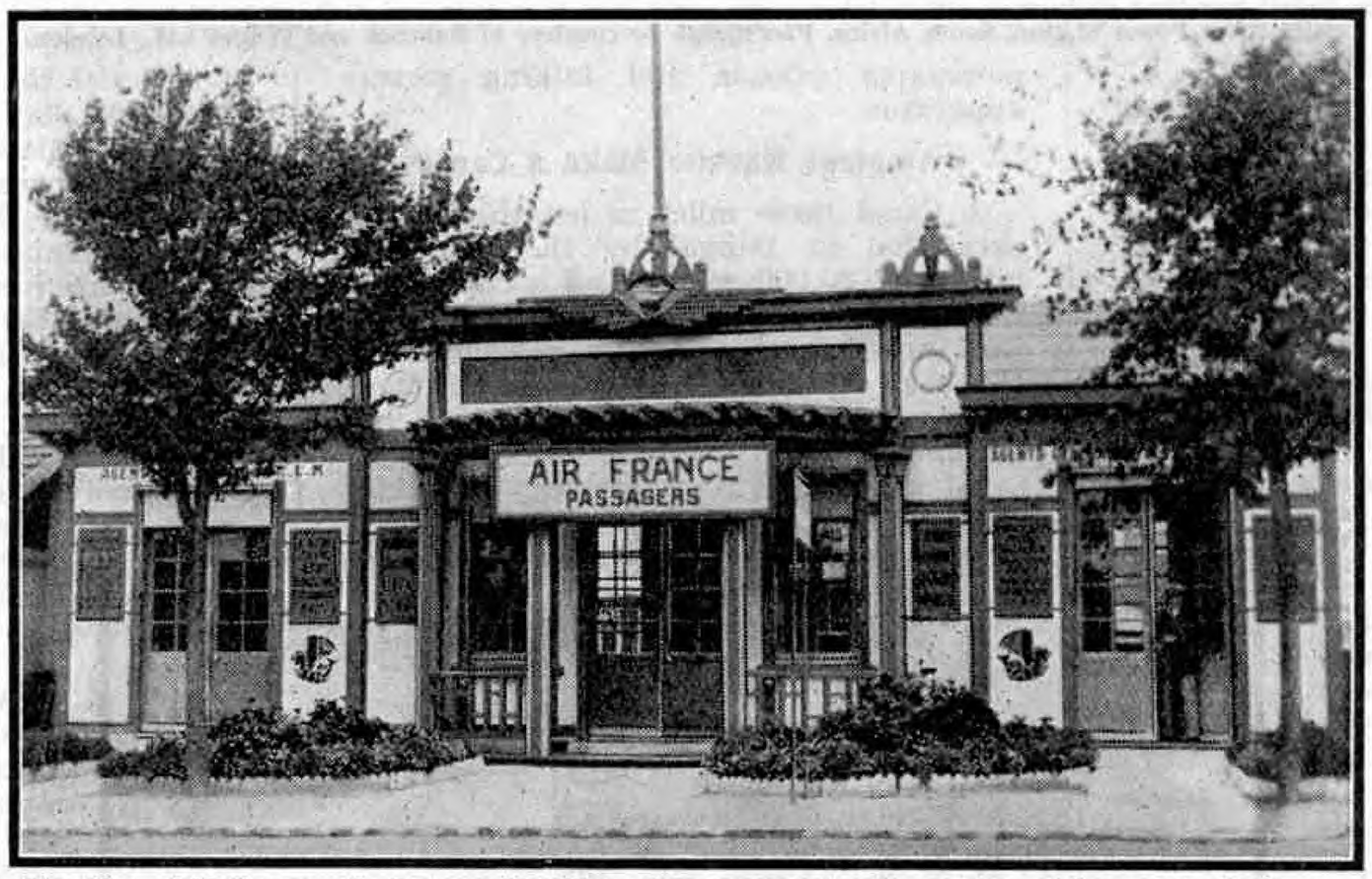
The Hub of many International Air Services

IN a comparatively few years Le Bourget has risen from an insignificant landing ground, with a few wooden huts and hangars, to be the chief airport of France. To-day it is the hub of numerous international air services, and aircraft leave there regularly for almost every European country. It is the headquarters of Air France, the principal French air transport company, who have their aircraft repair, inspection and testing shops there. Some idea of the importance to the airport of the traffic handled by this great company can be gained from the fact that on 8th June last year, when the Whitsuntide holiday traffic was at its height, 37 of the company's machines operated from Le Bourget and carried a total of 305 passengers.

The administrative buildings are grouped together on one side of the airport, and are set in grounds divided into well-kept gardens that at one point border on the landing ground and enable visitors to watch at close range the arrival and departure of the air liners. A feature of historical interest is an engraved stone set in the ground and commemorating the landing of Col. Lindbergh at Le Bourget on 21st May 1927, on the completion of his famous trans-Atlantic flight. The management building contains the administrative offices, of course, and also the Customs and Police offices and a restaurant. On the first floor is a buffet from the windows of which there is a fine view of the entire landing ground.

A large building immediately on the right of the airport entrance bears the name "Pavillon Paul-Bert," and part of the ground floor of it is occupied by a large waiting room for passengers. Adjoining this room are telephone booths and a telegraph office where passengers and their friends can despatch or receive messages by wireless. Much of the building is devoted to facilities for the exhaustive medical examination of pilots, navigators and mechanics, to determine their fitness or otherwise for their work. In the basement there is a compressed air chamber in which pilots are familiarised with the atmospheric conditions they will experience when flying at great heights, and are trained in the use of oxygen apparatus. The temperature of this chamber can be lowered to 50 deg. below zero.

Probably the most interesting room in the "Pavillon Paul-Bert" is a small one containing a table covered with wireless apparatus, a loudspeaker and a telephone. Towering above this gear is a large frame aerial in the middle of the table and reaching almost to the ceiling. On one wall is a large map of France on which the principal towns are indicated by graduated transparent circles. Thin cords each with a small ring at its free end are attached to the centre of the circles, and the rings are fastened to a sliding rod along the top of the map. The cords are used in determining the position of an aeroplane in flight, and when "plotted" each cord indicates the direction of a bearing. An approaching aeroplane, perhaps 200 miles from Le Bourget, on enquiring as to the best way to reach the airport, might be told by the operator in this room that "we make out your position to be 35 degrees. To get to Le Bourget proceed towards Cape..." (mentioning some geographical feature). Before these instructions are given the airports of, say, Dijon and Tours will have communicated their readings to Le Bourget at the request of the pilot. The cords are then plotted on the map according to these readings, and the point where the cords intersect shows the position of the aeroplane. So easily and quickly is all this carried out that the necessary information is communicated to the pilot of the machine within two minutes of receiving his enquiry.

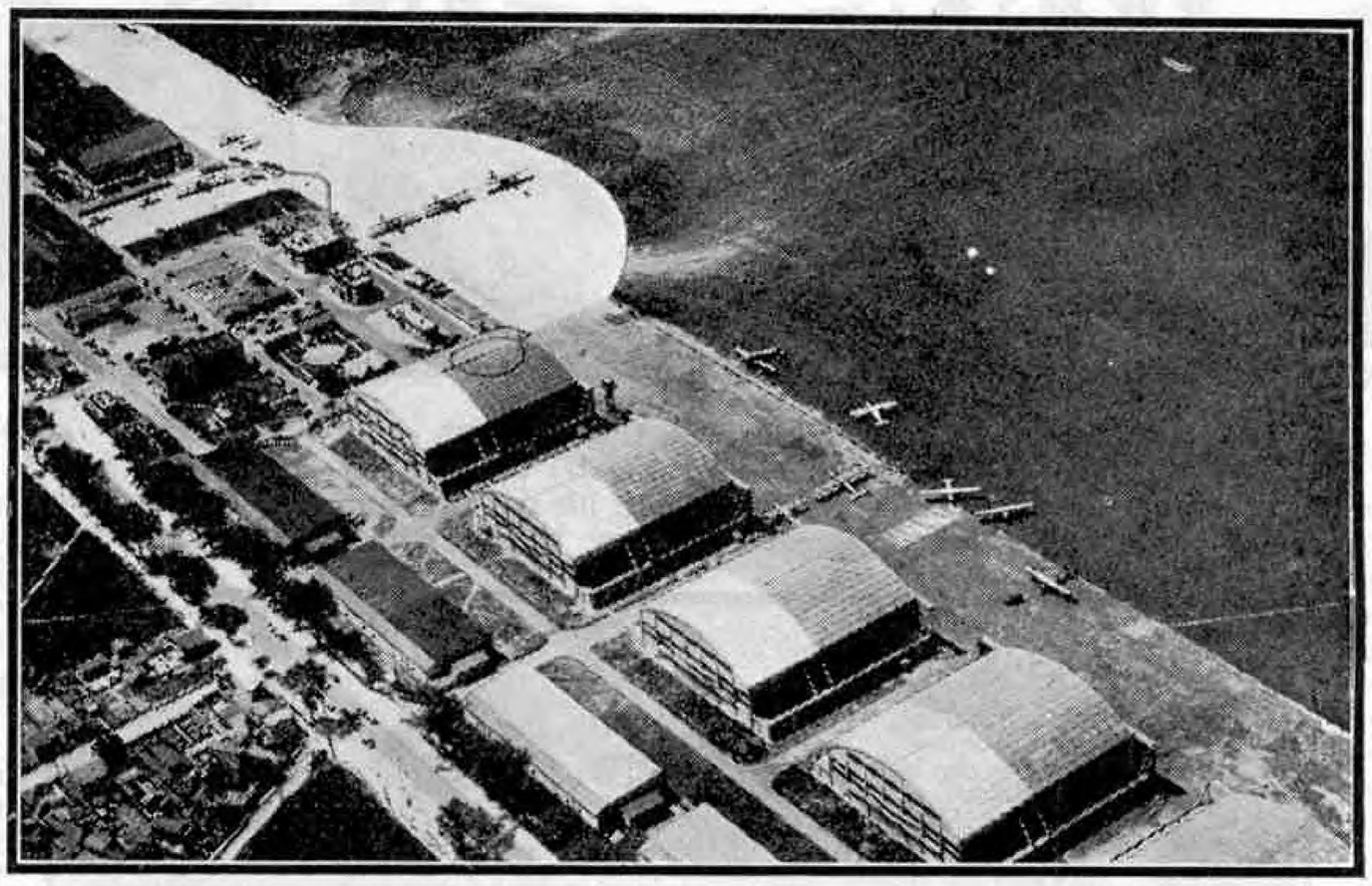


The offices of Air France at Le Bourget. The illustrations are reproduced by courtesy of Compagnie Air-France.

A meteorological department is essential to any important airport, and that at Le Bourget occupies one of the main buildings. It is there that the pilots study carefully the weather forecasts before setting out on their flights. The department is also one of 12 French meteorological stations that regularly broadcast weather reports. The control building stands on the edge of the landing ground, and from one of its departments the arrival and departure of every aeroplane is notified to the control tower by a written message that is rolled up, placed in a cylinder and despatched through a pneumatic tube to the tower, where it is broadcast by wireless. The control tower then re-despatches the message by pneumatic tube to the wireless department in the same building. The operators in this room have the job of linking up the department with other important airports on the main air routes. These airports include Lyons, Strasbourg, Brussels, Croydon and Amsterdam.

Wireless masts and aerials within an airport would be a danger to aircraft taking-off or landing, and the Le Bourget transmitters are situated at La Morée, just

outside the boundary of the airport. There are three of them, one operating on a short wavelength, the second on a medium one and the third on a long wavelength. The station is therefore well equipped to cope with the broadcasting requirements of the traffic and meteorological departments. There is another wireless station, at La Rosière, about ½-mile to the north of the La Morée station, and the operator there converses by wireless telephone with the pilots of aircraft in flight. His job is to ascertain their position, and if necessary to give them their bearings, and to communicate to them any weather advice and other useful information they require. In regard to aircraft bound for England this station keeps in touch with them as far as the French coast. They are then followed across the English Channel by the wireless station at Saint Inglevert, and on reaching the English coast they come within range of the wireless station at Croydon. Aircraft outward bound from Le Bourget to Germany are followed by the wireless stations of Cologne and Dortmund after they have passed out of range of La Rosière.



An aerial view of the airport. In the foreground are several of the large hangars. (Collection Air-France.)

The hangars at Le Bourget are vast reinforced concrete structures and are on the east and west sides of the landing ground.

The airport has, of course, prominent distinguishing signs that make clear its situation to approaching airmen, by day and by night. The most conspicuous sign during daylight is a large concrete circle, 164 ft. in diameter, in the middle of the landing ground. It is outlined by a white band nearly 16½ ft. in width, and has the name "Le Bourget" inscribed across it in an east-west direction, in letters 19 ft. 8 in. long.

At night the landing ground is illuminated by six powerful searchlights placed round the edge, and each has a flat beam of 180 degrees. The situation of the hangars is revealed at night by special red beacons, and the north boundary of the airport is indicated by red and white beacons placed at intervals of 164 ft. The wireless pylons are easily seen in the daytime, as they are painted with red and white alternate rings; and at night they are, with one exception, surmounted by clusters of red lamps. The exception is a pylon to the north-east of the landing ground, carrying a very brilliant searchlight of naval pattern which at night gives a flashing beam every three seconds. In clear weather this light is visible 50 miles away. A second pylon, 98½ ft. in height, is surmounted by a flashing beacon that shows a brilliant white light every 12 sec. and is sufficiently powerful to be seen 15 miles away. In addition to this extensive equipment there are two groups of permanent neon lights mounted on pylons at the north-east and north-west corners of the airport, and obstacles outside but close to the airport boundary, such as chimneys, tall houses, high tension cables, etc., are indicated by red flares.

Aircraft land in the direction of the wind, and at airports this direction is made known by pilots by a wind sock flown from the top of a mast or by some other device that indicates the direction very clearly. At Le Bourget it takes the form of a large letter "T" that is lit at night by white lamps fixed round its edges. Pilots are notified of the speed of the wind by means of a device adjoining the "T" and consisting of three illuminated bars each almost 10 ft. in length and arranged side by side. When none of the bars is lit the speed of the wind is less than 11.4 m.p.h.; when only one bar is lit the speed is between 11.4 m.p.h. and 22.8 m.p.h.; when two bars are lit it is between 22.8 m.p.h. and 34.2 m.p.h. and when all the bars are lit the wind speed is over 34.2 m.p.h.



Aircraft of Air France on the "tarmac" at Le Bourget. (Collection Air-France.)

The growing importance of Le Bourget and the rapidly increasing traffic have made larger accommodation for traffic and aircraft urgently necessary. New administrative and traffic buildings are to be built and the landing ground is to be practically doubled in size. The new administrative building will be built on the site of the present Customs and restaurant building. The ground floor will be in two parts, one containing the booking offices and waiting rooms, etc., and the other the Customs, baggage and freight departments. On the ground floor there will be the management offices, a restaurant and a large hall, and on the top floor there will be the airport traffic control services. It is estimated that the improvements will be completed by next summer.

We are indebted to the Fédération Aéronautique de France and to the Compagnie Air-France for the information contained in this article.



An Animal Engineer

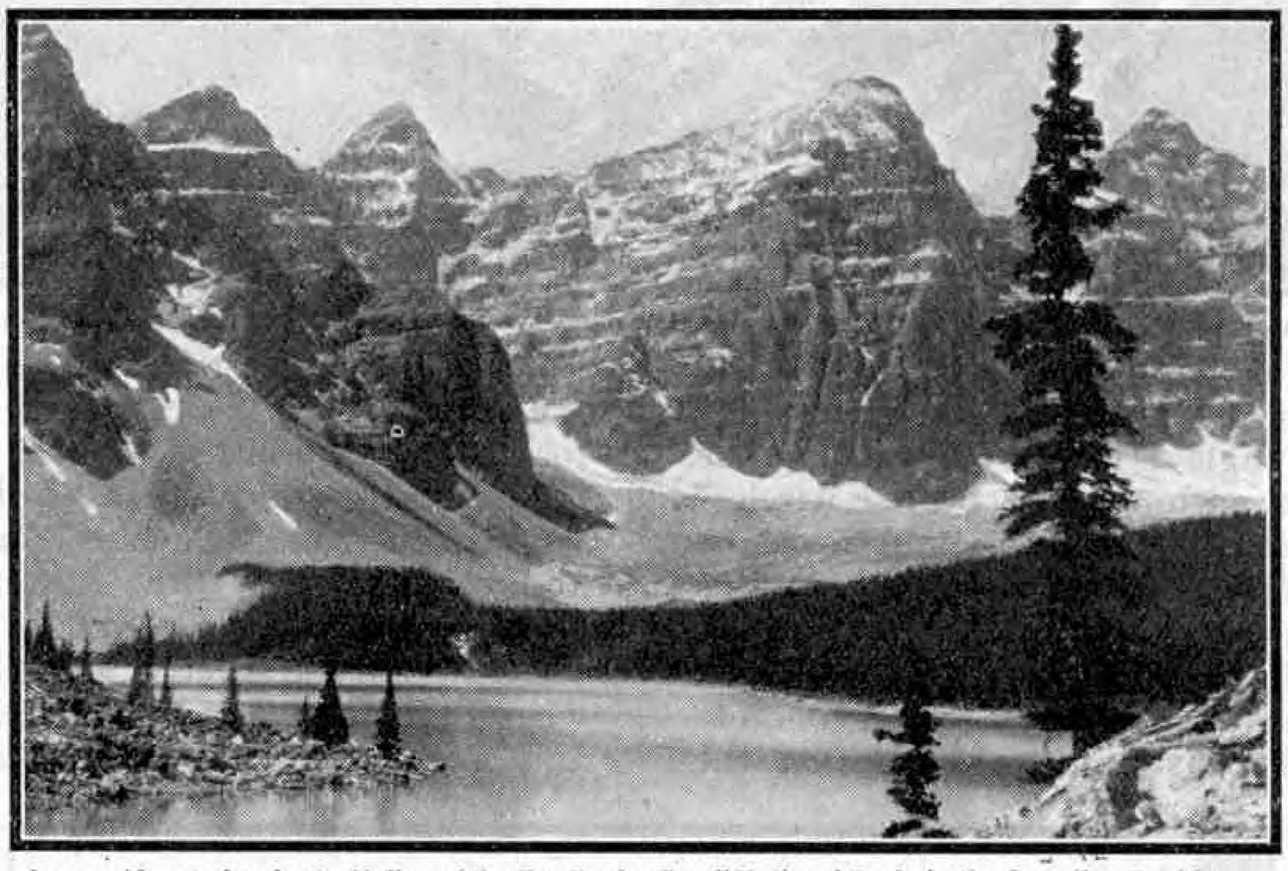
There are many instances of intelligence and skill to the credit of creatures of all kinds, from the tiniest of insects to the elephant, the largest of present-day land animals, but those who are familiar with the beaver have no hesitation in describing it as the wisest and most energetic of all. The beaver may indeed be described as one of Nature's greatest engineers, for he provides himself with a secure home by building a dam across a river in order to keep the water at a permanent high level in the dry seasons. His purpose in doing this is to ensure that the door of his house is always under water, and so is closed to intruding land animals.

The skill with which the beaver carries out the work of making a dam and building a home is sufficient proof of his intelligence. He gnaws selected trees until they fall exactly where he wishes, and then he cuts them up into building lengths of about 5 ft. The dam itself may be 30 ft. to 40 ft. in length, 5 ft. or 6 ft. in height and 4 ft. in width, and the branches used in building it are interlaced with each other in an amazingly skilful manner. A straight dam is built if the stream flows gently, but this wonderful engineer builds a curved structure, with a pressure-resisting arch upstream, if the flow is more rapid.

The beaver's house also is constructed of branches, plastered together with mud, and the walls are very thick indeed. It forms a great dome, about 8 ft. across and 8 ft. in height, either in the middle of a stream or on its bank, and access to it can only be gained by means of a long passage, which may be 30 ft. in length, leading from the submerged entrance.

As would be expected of such a wise animal as the beaver, he lives in a community in which all share in the work and danger as well as the pleasure of life. When alarmed by the approach of an enemy, he gives warning by striking the surface of the water with his flat tail, and this is a signal for every beaver within hearing to dive for safety immediately.

The beaver to-day is found chiefly in Canada and the United States. At one time he was common in Europe, but he has almost disappeared on this side of the Atlantic, chiefly because he has been keenly hunted for the sake of his fur. This is perhaps fortunate, for a colony of hard-working beavers can cause disastrous floods and make large areas unfit for human beings to live in.



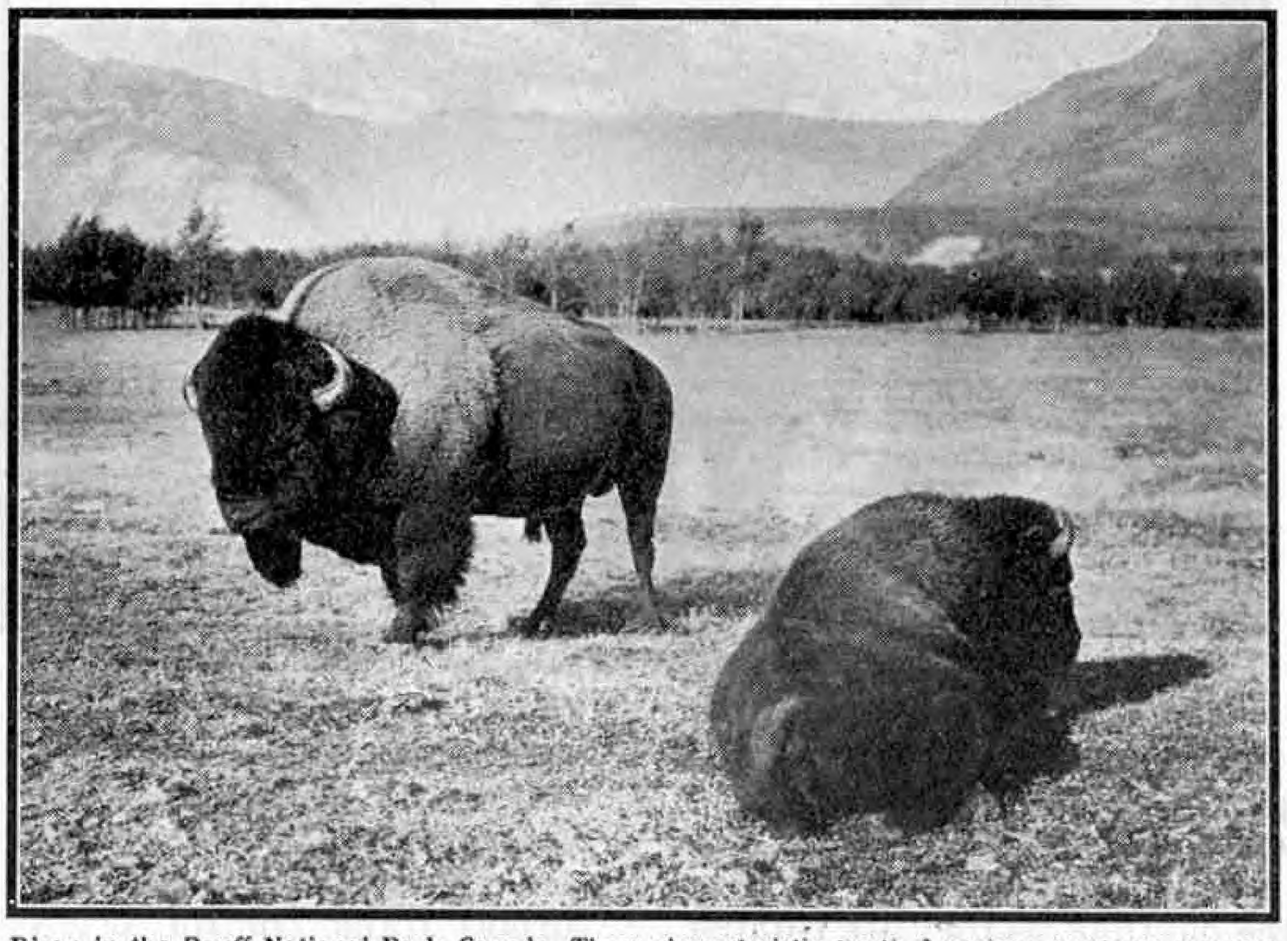
A magnificent view in the Valley of the Ten Peaks, Banff National Park, in the Canadian Rockies. In the foreground is Moraine Lake, behind which are some of the mountains that give the valley its name.

The Monarch of the Prairies

Another famous Canadian and North American creature with relations in Europe is the bison, which is usually but wrongly described as a buffalo, for the great hump on his shoulders and the long shaggy hair on the forepart of his body distinguish him from the true buffalo. Every reader must have revelled in the stories of the hairbreadth escapes of hardy adventures who braved him in his home on the American prairies. A well-grown bull may weigh little short of a ton, and one of this size must have presented a terrifying spectacle when charging with his head lowered, and his sharp curved horns ready for use.

It is difficult for us to imagine the American prairies as they were in the great days of the bison, when he was the monarch of the plains. It has been estimated that there were from 30,000,000 to 60,000,000 bison in North America when the New World was discovered. As late as 1870, when the country was being settled, there were still more than 5,000,000, and on one occasion a traveller in the West passed through a herd stretching continuously over 25 miles. Bison derailed trains and stopped boats on the rivers, but they could not live with the increasing population and the advance of the railways, and by 1880 they were practically exterminated.

Fortunately a few remained in the wild region near the Great Slave Lake in Canada, and two small herds in the United States also were preserved. The creature takes kindly to life in reservations, and to-day increasing herds are to be found in Buffalo Park, Wainwright, Alberta, Canada, in another reservation near the Great Slave Lake, and in the



Bison in the Banff National Park, Canada. These characteristic North American creatures are now to be found only in reservations.

Yellowstone Park in the United States.

It is two or three thousand years since the European bison was abundant, and now only a few herds remain in the Caucasus Mountains and in a reservation in Russia. These bison are smaller than those of America. When in their prime they lived in forests, and not on rolling prairies, and as a result the herds were smaller.

World's Largest Land Mammal

Even a bison weighing nearly a ton would look comparatively insignificant when placed alongside the baluchitherium, a gigantic creature three times as tall as a man, that flourished millions of years ago in Central Asia. The baluchitherium was the largest land mammal that ever lived, and he was twice as long as the elephant, the largest animal of this kind now living.

All that we have of this giant to-day is about 200 fossilised bones, laboriously collected during expeditions to the Gobi Desert, which was a paradise for animals when it stalked the Earth. After 10 years of patient work the bones have been sorted out and put together to reproduce a skeleton that shows it to have been nearly 18 ft. tall. Its shoulder would have towered above the head of the tallest of modern giraffes, and its weight must have been little short of nine tons. A baluchitherium would have been a costly animal to keep, for it must have required at least 500 lb. of vegetable food daily!

Secrets of the Deep Sea

Now that comparatively few places on land remain unexplored, the sea is the last place in the world to hold its mysteries. There is promise of revelations of its secrets in the continued use of Dr. Beebe's bathysphere, a steel ball in which that deep sea explorer was lowered to great depths, as explained in the *"Of General Interest"* pages of the *"M.M."* for June 1935; but at present we receive only occasional news of the strange creatures that live far below the surface of the sea. For instance, a year or two ago a deep sea telegraph cable sunk to a depth of 4,500 ft. in the Bay of Bengal suddenly became "dead," and when it was hauled to the surface for examination a shark's tooth was found deeply embedded in it. The creature that had tried to make a meal of the copper strands of the cable, with disastrous results to itself, was not an ordinary shark, however, but an elfin or goblin shark, a curious fish with a mysterious blade-like projection on the top of its head.

Until the sudden appearance of this tooth there had been no suspicion that the elfin shark ever found its way into the Indian Ocean, for its home appears to be in the seas off the coast of Japan. A little more than 30 years ago its very existence as a living fish was unknown, but strange to say, almost as much was known about it then as now, for the fossilised teeth of elfin sharks that lived in the seas of 100 million years ago were familiar to scientists. It is curious that its appearance in the Indian Ocean should be revealed by the discovery of a tooth, since it was to the teeth of this creature that we owed our first knowledge of its existence.

There is another shark in Japanese waters that is fully as mysterious as the elfin shark. This is between 4 ft. and 5 ft. in length, and has a slender body that has suggested the sea serpent to many of those who have seen it. It is known as the frilled shark, because it has a series of frill-like projections round its neck. Like the elfin shark, it made a very dramatic appearance in regions remote from Japan, for a fine specimen actually was displayed on a marble slab in a fishmonger's shop in this country. Fortunately an expert who recognised the strange fish was among those who stopped to look at it. He wondered what this very rare shark was doing in England, so far away from its usual haunts, and on enquiry learned that it had been captured off the west coast of Ireland.

Both frilled and elfin sharks are in a sense relics of the past, for they represent a very primitive type of shark from which the formidable and voracious creatures that we know from stories and pictures have been developed.



The beaver, Nature's greatest engineer, a rodent now scarce in Europe, but still abundant in North America. Our photograph was taken in one of Canada's National Parks, and shows the beaver's curious flat tail.

Noises that we Cannot Hear

Noises that we cannot hear are by no means uncommon. A cat will respond to a sound that is too high-pitched for human ears, and other creatures behave in a similar manner.

Insects are sources of noises that are outside our own range of hearing. For instance, the cricket produces other notes than those we know so well when it rubs its hind legs against the rough surface of its fore wings. Although we cannot hear these notes directly, it has now been found possible to reproduce them in a lower pitch, and thus to give us some idea of their sound. For this purpose the waves are focussed on a quartz crystal cut in such a manner that it shows the peculiar property of producing feeble electric current in response to the pressure. The electric current is then amplified and fed to a loud speaker circuit, so that the original noises are brought within our range of hearing.

One very curious experiment carried out with this new apparatus has enabled the ticking of a watch to be heard at a distance of 30 ft., not by magnifying the sound so familiar to us, but by detecting higher notes that we cannot hear and translating them into others of lower pitch.



Cutting withies, or willow branches, near Burnham-on-Sea, Somerset. This work is carried out in February, and the branches being gathered are to be used in making hurdles. Photograph by Miss I. Marsh.

How the Value of Platinum has Changed

I have been able to obtain some further interesting details of the strange fluctuations in the price of platinum, to which reference was made on page 155 of the March *"M.M."* During the War, and shortly afterwards, the price of this metal soared as high as £40 per ounce. The natural result was a search for substitutes, and this, with the increase in supplies from Canada, South Africa and South America, brought the price lower. The metal indeed is now much cheaper than was indicated in the March *"M.M."* Its present value is about £7 per ounce, and thus it is actually of less value than pure gold, although its price was so high only a comparatively short time ago.

These details have been given me by Johnson Matthey and Co. Ltd., in whose works the photographs on page 155 of the March *"M.M."* were taken. A platinum vessel weighing 322 oz. troy manufactured by that Company in 1809 cost £280. Its cost to-day would be £2,300 and during the War would have been £13,000.

Castles in the Holy Land

Engineering Triumphs of the Crusaders

By H. J. Shepstone, F.R.G.S.

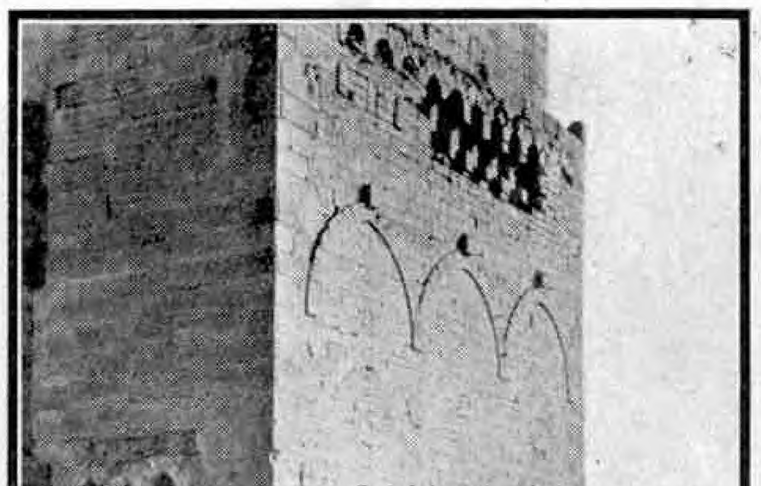
ONE cannot travel through the Holy Land without being impressed with its relics of the Crusaders. These take the form of castles, forts, towers, churches and monasteries, and one encounters them not only in Palestine, but also in Transjordania and Syria. Great interest is now being shown in these historic remains of a picturesque and romantic age. Evidence of this is given by the restoration of a great castle built by Crusaders at Athlit, near Mount Carmel. This work is being carried out by the Antiquities Department of the Palestine Government, and across the Syrian border the French are repairing the Kalat-el-Husn, another mighty fortress of the same age near Homs.



The ancient walls of Tiberias, on the sea of Galilee. The walls were built by the Crusaders, and there were no buildings outside them 30 years ago, when our photograph was taken.

Up to the 11th century Christian pilgrims visited Jerusalem and the Holy Land without any serious vexation. Then came the Saracen invasion. Pilgrims were extortionately taxed, their persons and devotions insulted, and their lives imperilled. This led to the call for a crusade, the need for which was preached by Peter the Hermit, and for two centuries, from 1093 to 1291, armies from Western Europe invaded Syria and Palestine to wage holy war for the possession of Jerusalem.

Throughout the Crusades there breathed a spirit of romantic fervour that has never ceased to arouse admiration and wonder. The Crusaders were at once dreamers, worshippers and fighters. They believed in their mission, and their gallant deeds, particularly those of Richard I, the lion-hearted King of England, who led the third Crusade, never failed to grip the imagination. During the first Crusade, Jerusalem actually was taken and became the centre of a Christian Kingdom that lasted for some 80 years. Its fall led to renewed efforts, but eventually crusading zeal died away and Palestine remained in the hands of the Saracens.



One of the towers of the Kalat-el-Husn, a great fortified citadel built near Homs, Syria, during the Crusades.

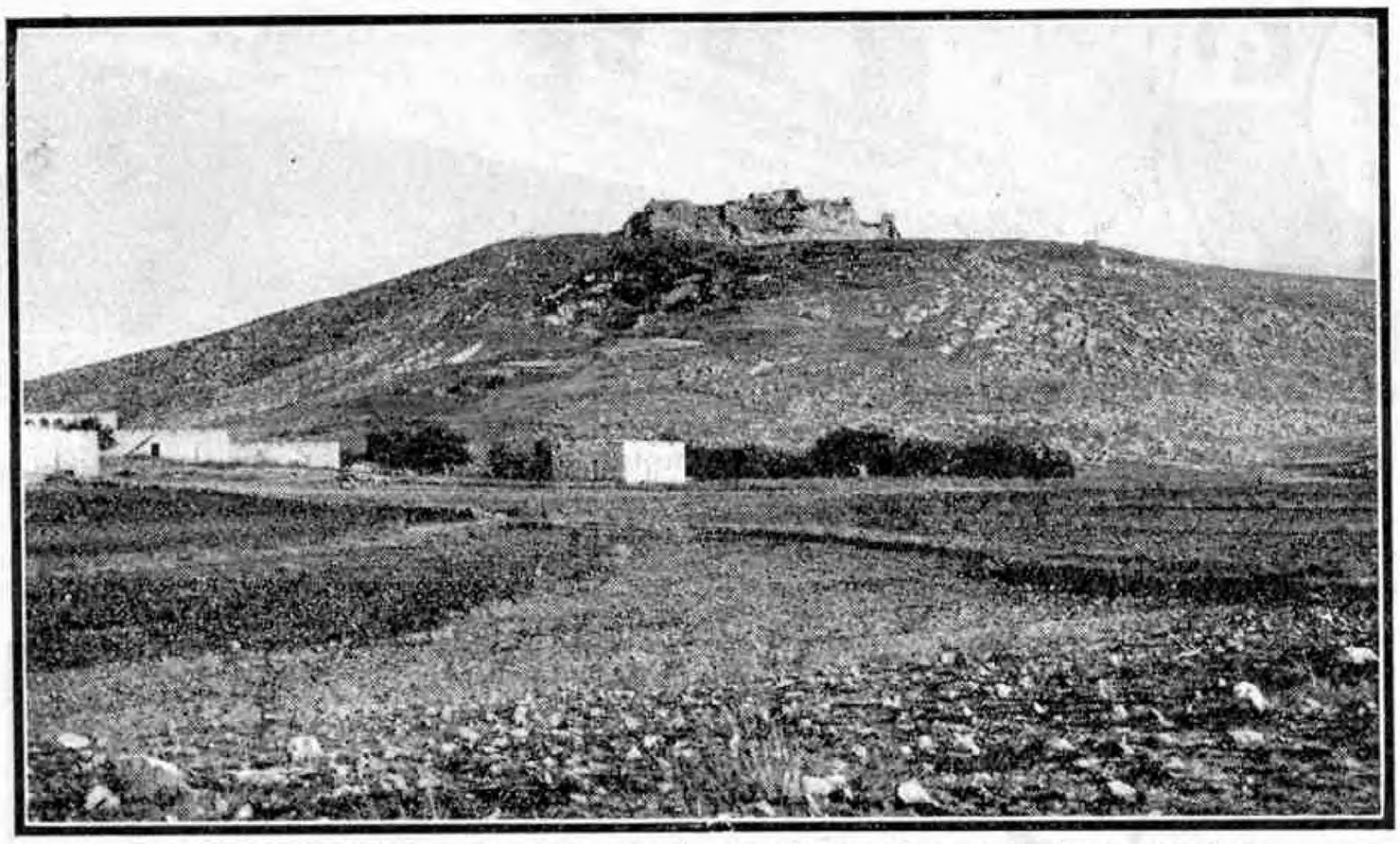
The soldiers of the Cross certainly left their mark upon the sacred land of Palestine. Even the Church of the Holy Sepulchre itself may be said to represent Crusaders' work, for the south facade, and many parts of the sacred building, particularly the bell tower, was built by them during their occupation of Jerusalem. Both at Ramleh and Lydda, two important towns on the road from the Holy City to Jaffa, may be seen churches built by the Crusaders. The Church of St. John at Ramleh, built in the twelfth century, is said to be the finest example of a church of that period in existence. Ramleh was for a time the headquarters of King Richard.

Near Arsuf, just above the town of Jaffa, are the ruins of an old Crusaders' castle, interesting in that it was there that Richard defeated Saladin in battle, his greatest achievement in Palestine. Farther north at Athlit, a little to the south of Haifa and Mt. Carmel, are the remains of what was once a mighty Crusaders' stronghold. The ruins stand on a promontory jutting out into the sea, and all we have to-day are the remains of a great tower, magazines, church, huge banqueting hall, cisterns, and tombs. The *Castellum Peregrinorum*, or Castle of the Pilgrims, stood at Athlit. It was the principal seat of the Knights of the Temple, or Knights Templars, an order formed for the purpose of protecting travellers to Jerusalem from bandits that infested the route, and pilgrims visiting the Holy Land used to land there. The Antiquities Department of the Palestine Government have been excavating the site, and it is their intention to clear out the Bedouins who have taken up their abode among the ruins, and to make these more accessible to visitors. These relics of a heroic age are certainly worthy of preservation.

The principal attraction of Acre to-day is its Crusaders' castle. After the fall of the Holy City, Acre became the

residence of the King of Jerusalem. It was there that Richard I landed during the third Crusade, and in the plains outside the city occurred many of his famous contests with Saladin. the chivalrous Saracen leader.

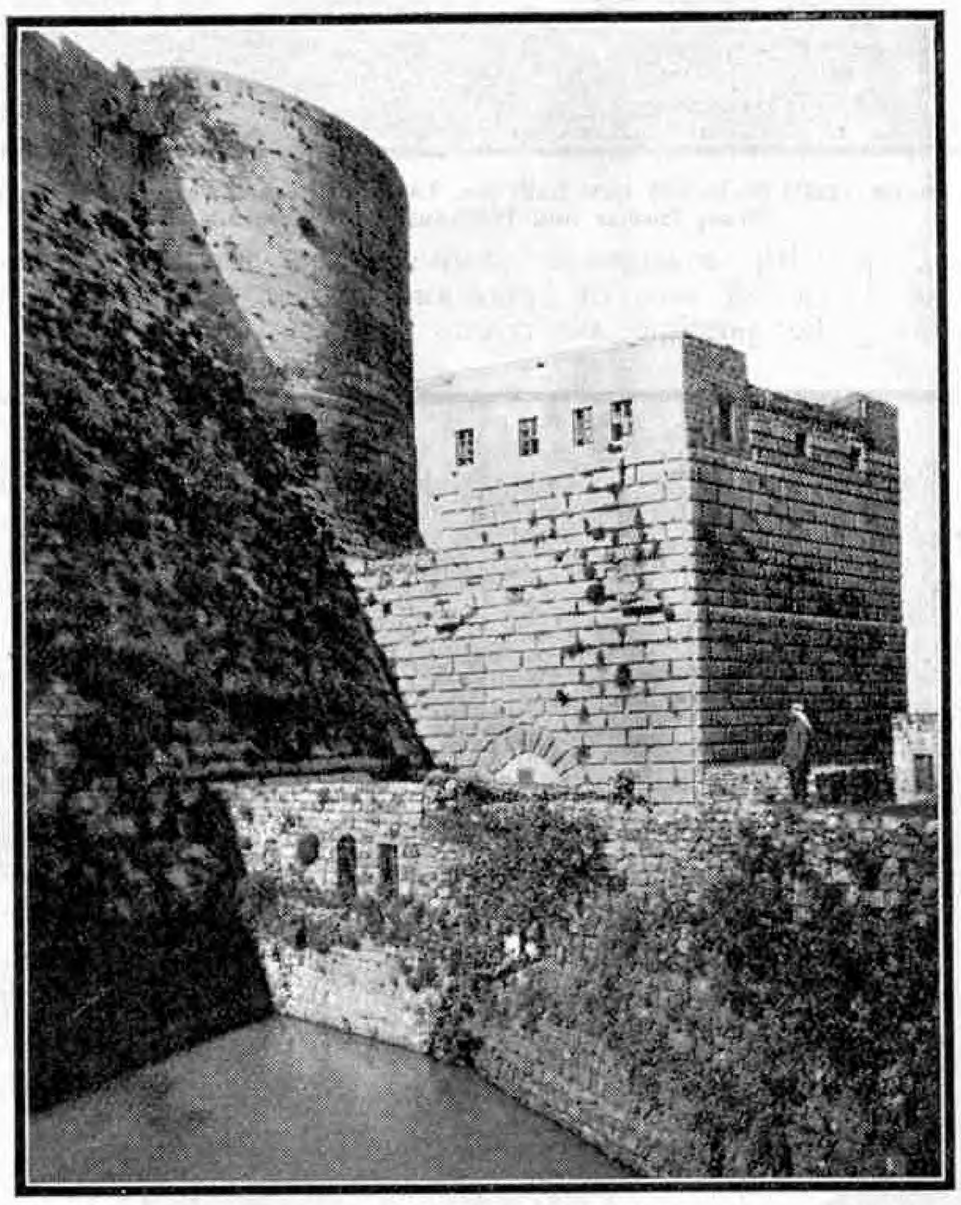
Tyre also can boast a reminder of the Crusades in the form of the remains of a fine old church. According to tradition this is the burial place of Frederick I, Emperor of Germany, called Barbarossa because of his red beard, who took part in the third Crusade but died before reaching the Holy Land. So far excavations have failed to locate his tomb, however. Going farther north, over the border of Syria, one finds Belfort Castle, standing alone on a great mound and forming a conspicuous landmark for miles. I recall discovering a little patch of snapdragon flowers on its walls. I was assured that the plant is not to be found elsewhere in Syria, and it is perhaps not a far-fetched inference that some Crusader's lady brought it from the garden of a distant French or English home.



The ruins of Belfort Castle, a stronghold of the Crusaders built on the summit of a mound in Syria.

Castle ruins are to be seen all the way up the coast to Antioch, the city where "the disciples were first called Christians." Antioch was the first city in Syria to yield to Crusaders, for it was taken by the armies of the first Crusade on their way to Palestine itself. No sooner had they captured the city than they were themselves besieged by a Moslem army from the east, and they were so worn by disease and starvation that it seemed impossible to hold out.

At the critical moment one of their number, a chaplain called Peter Bartholomew, had a vision of the Holy Lance. According to his story St. Andrew had revealed to him that this precious relic, the very spear that had pierced the Redeemer's side, had been hidden in the church of St. Peter. It was discovered there and its production filled the famished Crusading army with miraculous zeal. They rushed upon the besiegers, took them wholly by surprise, and routed them, capturing all their treasures and provisions.



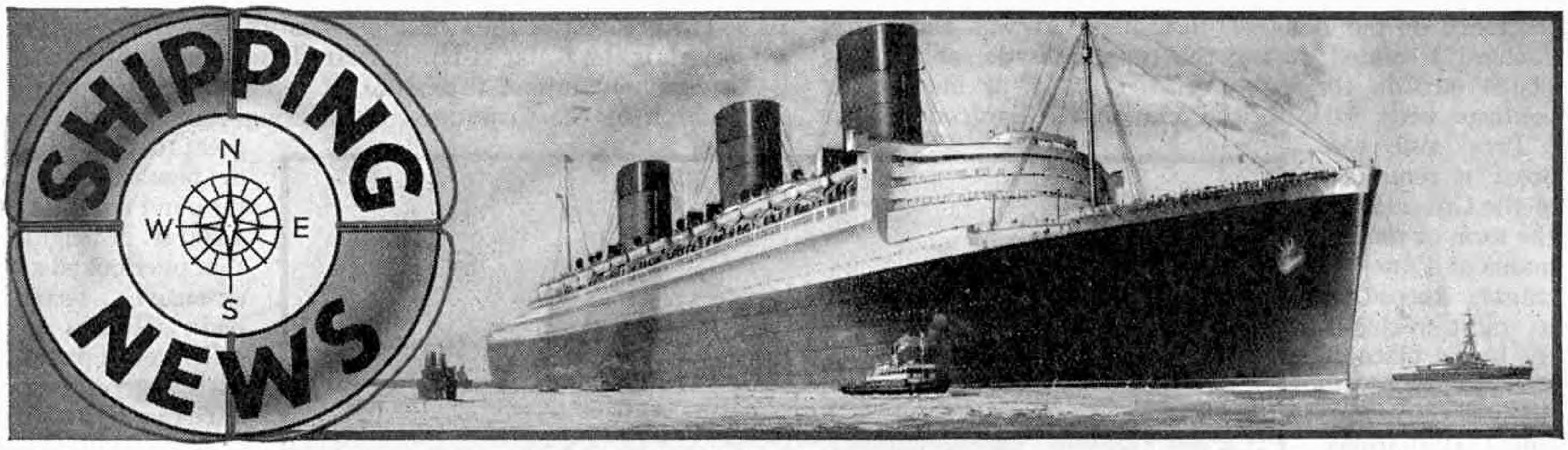
Another part of the ruins of the Kalat-el-Husn. This Syrian castle was the greatest triumph of the military engineering of the Crusaders.

This occurrence, while saving Antioch, which remained under Crusader influence for 170 years, came near to defeating the whole enterprise, for from it developed a bitter quarrel between their leaders, Raymond of Toulouse, who supported the authenticity of the miracle, and Bohemond, who regarded it as a pious fraud.

The greatest of the Crusaders' castles, and the best preserved, is the Kalat-el-Husn, near Homs, which the Syrian Government intend to restore. It represents the supreme triumph of the Crusaders' engineering genius. It was a great fortified citadel perched upon a prominence, 1,000 ft. in height, that overlooked an extensive fertile plain. Within its walls were a palace with a great banqueting hall, church, monastery, barracks and armoury, and there the knights entertained each other and enjoyed a brilliant social life. The wonder of the castle is its great size and the massiveness of its walls, and indeed the western world has nothing to compare with it. It was protected by great towers with walls 30 ft. thick, a moat, and ramparts that were unscalable. As far as records show, no enemy ever succeeded in gaining entrance to it while it was in the possession of the Crusaders.

This superb relic of Crusader architecture is at present occupied by villagers, with their flocks of goats and cattle and horses. The great hall of the knights is half filled with rubbish, and the once grand chambers where lordly knights and their fair dames entertained guests listening to minstrels and jesters have been converted into houses. The peasants and their cattle are now to be turned out and the castle thoroughly restored. This should result in its becoming one of the show places in this land of sacred memories, and should do not a little to call attention to the formidable array of Crusader relics, picturesque reminders of a warlike and chivalrous age.

The Crusades not only introduced the western castle into the Holy Land, but also brought back from the East something of its architecture. They were responsible for the first great contact between the East and the West, and it was due to them, more than to all other causes, that there was such an immense increase of Eastern merchandise in Western markets, not only of relics from Jerusalem, but of Damascus ware and of Persian and even Indian produce. The direct influence of oriental architecture is to be seen in the models of the Dome of the Rock, the sublime edifice on the Temple Area at Jerusalem, that rose on at least three European sites during the Crusades; and in examples of Arabesque decoration brought home by Crusaders.

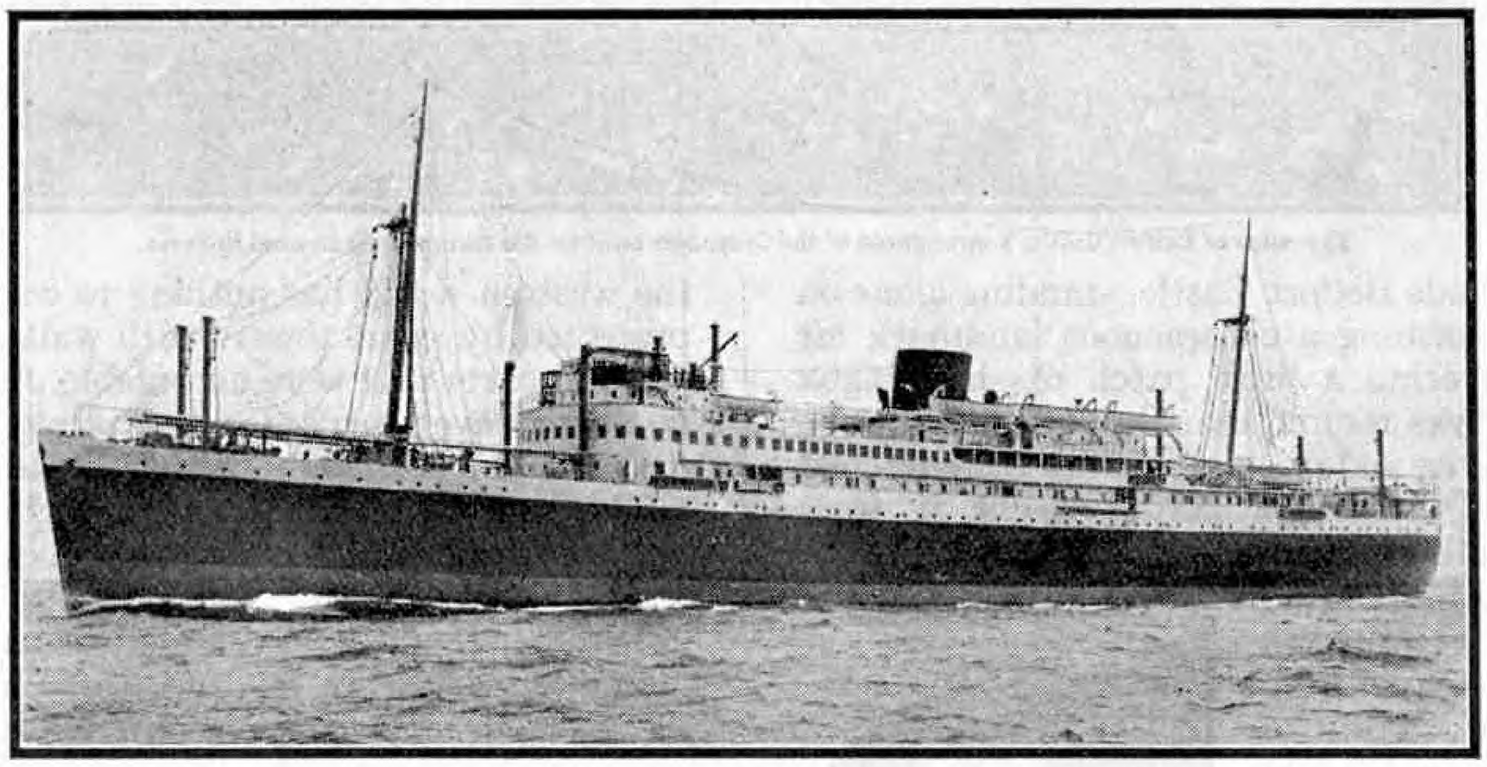


High Speed Patrol Boat for the Timor Sea

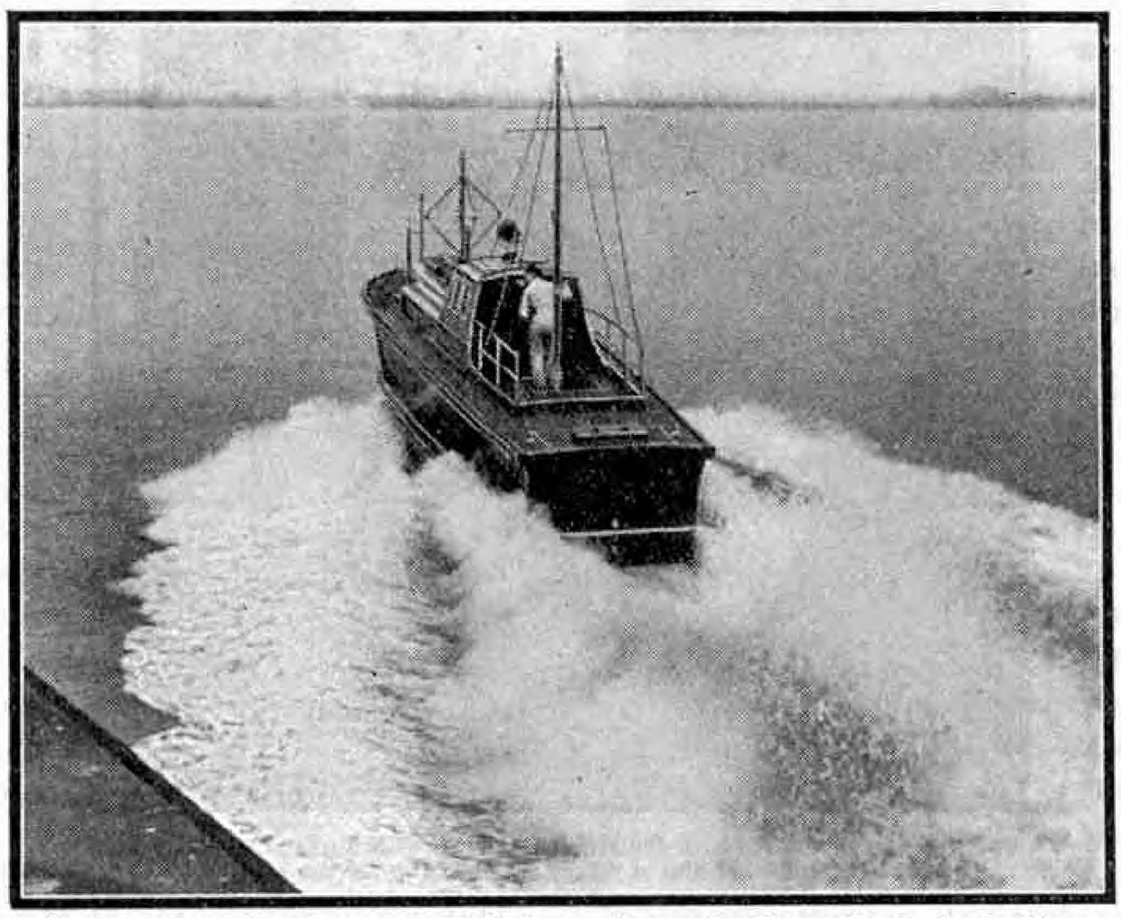
The lower illustrations on this page and the one opposite show a triple-engined high speed sea-going patrol and rescue launch recently built by the British Power Boat Co., Southampton, for the Australian Department of Defence. She was designed by Mr. Hubert Scott-Paine, the famous racing motor boat designer and pilot, who has spent almost a life-time in costly experimental work with craft of this kind. Her three Power-Meadows motors develop a total of 300 h.p. and give her a maximum speed of 27 knots, or 32 m.p.h. One of her most outstanding features is that she has a range of 950 miles at a cruising speed of 17–18 knots, or about 20 m.p.h., and could therefore travel from Land's End to John O' Groats by way of the Straits of Dover without stoping to refuel.

The control compartment of the new boat resembles the inside of a saloon car, for glass windows give an unobstructed view forward and to the sides, and an electrically driven revolving panel in the windscreen provides a clear view ahead when she is being driven through heavy seas or rain. She is extremely easy to handle. Her two rudders are operated by means of a steering wheel similar to that of a car, and only three small throttle-levers are required to give control of her motors. The design of these control levers is an adaptation of the system employed in aeroplanes, and they incorporate Power Bendix hydraulic gear, by means of which the motors are automatically put in and out of gear, and in and out of reverse.

The boat is for use in connection with the Empire Air Route scheme, and she will patrol the shark-infested Timor Sea, northwest of Australia, ready to dash to the rescue of aircraft that have been compelled to descend. She also will be required to aid ships in difficulties, to take part in the protection of pearl fisheries, and for general coastal duties. Marconi wireless receiving and transmitting equipment is installed to enable her officers to keep in constant touch with coastguard stations and aircraft in her area of operation. In her it will be possible to rescue and convey at high speed to land as many as 40 to 50 persons. A similar type of boat supplied by the British Power Boat Co. to the British Navy has a capacity of 100 men.



The "Duntroon," a motor vessel of 10,335 tons built for Australian coastal service. Photograph by courtesy of Swan, Hunter and Wigham Richardson Ltd.



A high speed patrol and rescue launch, for service on the Timor Sea, on her trials on Southampton Water. She was built by the British Power Boat Co., Southampton, to whom we are indebted for this illustration and the lower one on the opposite page.

British Cruiser and Destroyer Launches

Notable naval launches of the first few months of 1936 included that of H.M.S. "*Newcastle*," which took place in January at the yard of Vickers-Armstrong Ltd., Newcastle-on-Tyne. This vessel was the first of the "Southampton" class of cruiser to be launched, and she will be delivered in January 1937. She has a waterline length of 584 ft., a beam of 61 ft. 8 in., and a displacement of 9,000 tons. Her turbine machinery is of 96,000 s.h.p., and is designed for a speed of 32 knots. She will carry 6 in. guns in triple turrets, and her armament also will include eight 4-in. anti-aircraft guns, 22 smaller guns and eight torpedo tubes. She will carry two aircraft and will be fitted with a catapult to launch them.

A sister ship, H.M.S. "*Sheffield*," is under construction in the berth adjoining that vacated by the "*Newcastle*." The machinery for both vessels is being made at the Barrow-in-Furness works of Vickers-Armstrongs Ltd. H.M.S. "*Southampton*," the second vessel of this class, was launched from the Clydebank yard of John Brown and Co. Ltd., in March.

Two destroyers, H.M.S. "*Hero*" and H.M.S. "*Hereward*," also are being built at Newcastle by Vickers-Armstrongs Ltd. H.M.S. "*Hostile*," the first of the eight new torpedo-boat destroyers of the "*Hero*" class, was launched in January at Devonport, and H.M.S. "*Hunter*" was launched at Wallsend by Swan, Hunter and Wigham Richardson Ltd. in February. The vessels of this class have a displacement of 1,350 tons, and a designed speed of over 35 knots.

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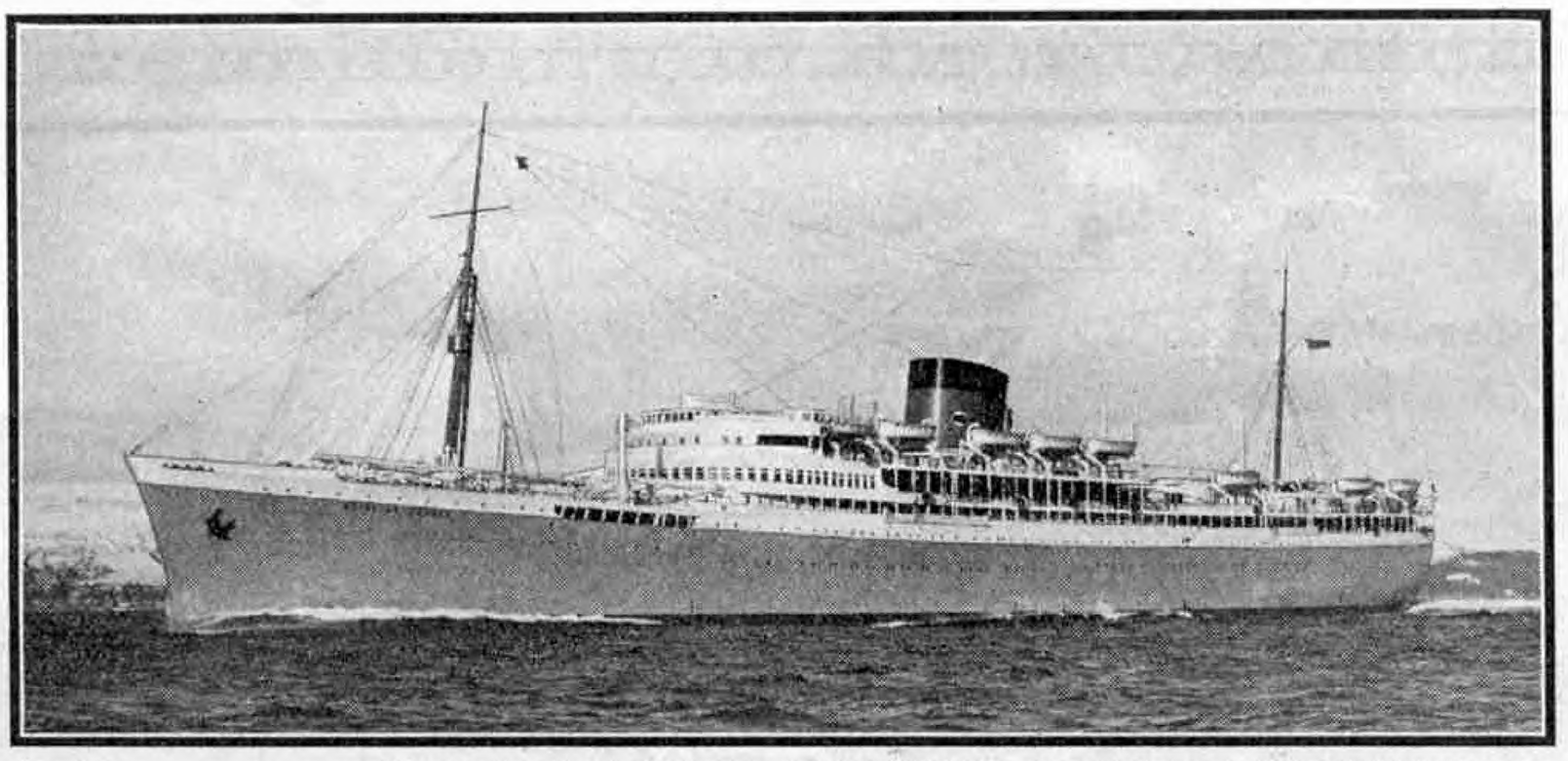
Camper and Nicholson Ltd., of Southampton, are building a steel twin-screw motor yacht for Mr. T. O. M. Sopwith, the well-known yachtsman. This will be the largest of its kind yet built in the British Isles. It will have a length of 262 ft. 3 in., and a beam of 38 ft.

New South African Mail Vessel

The twin-screw motor vessel *"Stirling Castle,"* illustrated on this page, was built by Harland and Wolff Ltd., Belfast, for the South African service of the Union-Castle Mail Steamship Co. Ltd. She was launched on 15th August of last year and sailed from Southampton on her maiden voyage on 7th February.

The *"Stirling Castle"* has a gross tonnage of 25,550, an overall length of 725 ft., and a breadth of 82 ft. She has a curved, rounded stem and a cruiser stern, with two masts and one low streamlined funnel. Her hull is divided into watertight compartments by 11 bulkheads, and she has a continuous double bottom in which fresh water, water ballast and oil fuel are carried. Three hulls forward and four aft are available for ordinary cargo, and insulated cargo capacity of 330,000 cu. ft. is provided. This space will be devoted largely to the carriage of citrus fruits and similar South African products. She has accommodation for 297 first-class and 492 cabin passengers.

The Diesel engines of the vessel have a total output of 24,000 s.h.p., and give her a speed of about 21 knots. They are of the 10-cylinder, double-acting, two-stroke cycle type, employing airless injection of fuel, and are the highest powered ship's motor engines yet built in Great Britain. Five Diesel-driven generators, each with an output of 700 kw., provide electric power for auxiliary services.



The twin-screw motor vessel "Stirling Castle," built by Harland and Wolff Ltd., Belfast, to whom we are indebted for our illustration. This vessel has a gross tonnage of 25,550, and her two-stroke cycle Diesel engines develop 24,000 s.h.p.

American Liner Construction

The construction of a new liner of 33,000 gross tons for the United States Lines has been commenced at Newport News, Virginia, by the Newport News Shipbuilding and Dry Dock Company. The new vessel will replace the *"Leviathan,"* which was laid up last year. She will be of similar class to the *"Manhattan"* and the *"Washington,"* and will be operated in the service between New York and Europe. Her cost is estimated at £2,500,000.

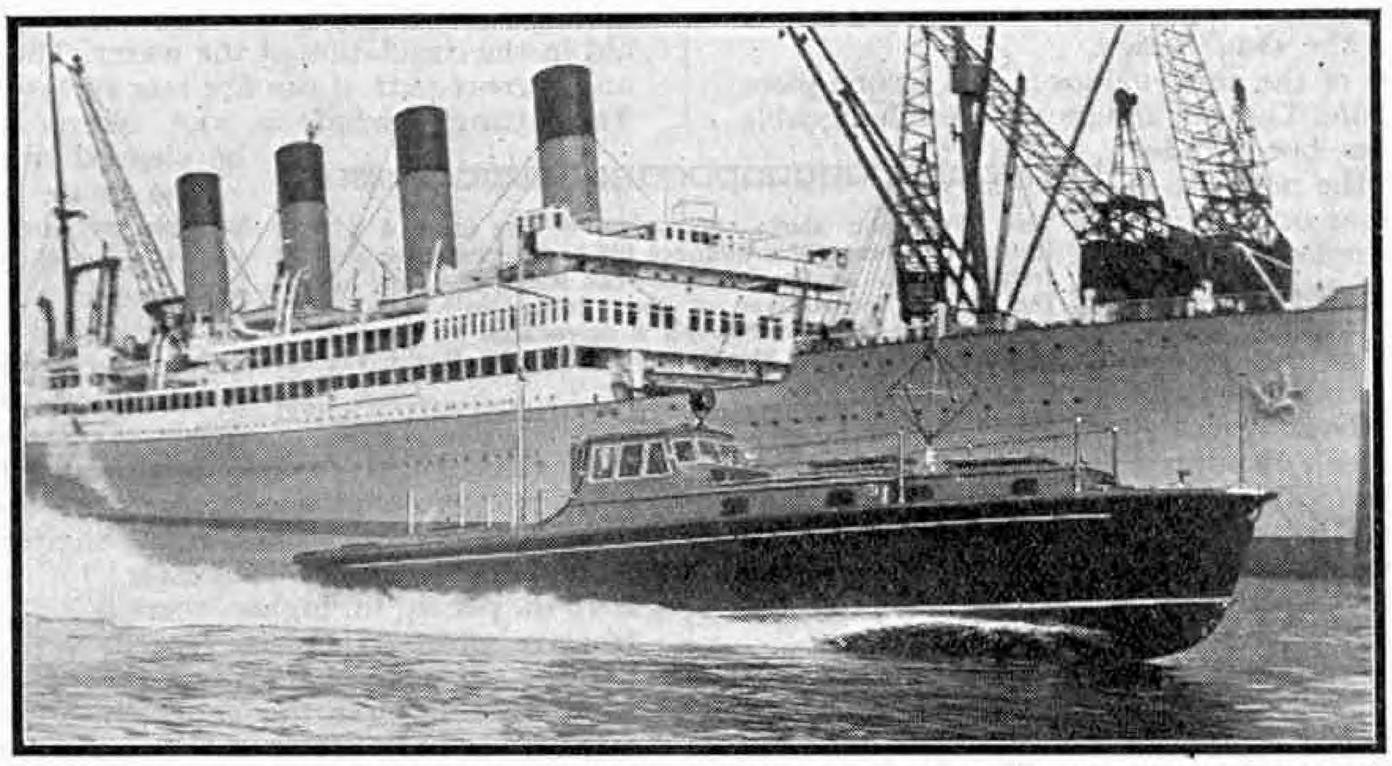
There has been some discussion recently in New York as to the building in the United States of two 100,000-ton liners, that will be larger and faster than any ship hitherto either built or projected. The estimated cost is £20,000,000 and the two ships, if built, will be 1,250 ft. long and will be capable of a speed of 38 knots. The suggested design provides for telescoping funnels and a space 800 ft. in length and 140 ft. wide for the landing and taking off of aeroplanes.

Motor Ship for Australian Coastal Service

The upper illustration on the opposite page shows the *"Duntroon,"* a twin-screw passenger and motor ship owned by the Melbourne Steamship Co. Ltd., and employed in coastal service in Australia. She was built by Swan, Hunter and Wigham Richardson Ltd., and left the Tyne for Australian waters in August, 1935. She has the distinction of being the first passenger ship to be fitted with British built main machinery of double-acting, two-stroke cycle design, and it is interesting to note that she was the fifth motor vessel built in Great Britain since 1929 for the Australian coasting service.

The *"Duntroon"* is 472 ft. in length and 65 ft. in breadth, and has a gross tonnage of 10,335. Each of her two Diesel engines has six cylinders and together develop a total of about 7,200 s.h.p. Her contract speed is 16¾ knots, and during her trial she attained 19 knots.

Ample provision is made for the carrying of general cargoes, and in addition space is provided for refrigerated cargo, the total insulated capacity being about 14,500 cu. ft., and for the transport of livestock. A notable feature of the vessel is the sumptuous character of the passenger accommodation. The number of first-saloon passengers that can be carried is 266, and provision for 107 second-saloon passengers brings the total accommodation to 373.



Another view of the motor boat illustrated on the opposite page. The vessel's motors develop a total of 300 h.p. and she has attained a speed of 27 knots, equivalent to 32 m.p.h.

Motor Lifeboats of Novel Design

Two motor lifeboats, the first of a new type, have just been completed for the Royal National Lifeboat Institution. One of these boats has been named *"Royal Silver Jubilee, 1910-1935,"* and will be stationed at Wells, Norfolk, and the name given to the other, to be stationed at Ilfracombe, Devon, is *"Rosabella."*

The new boats are much lighter than any now in the lifeboat fleet, for each weighs about 3½ tons, while the weight of the lightest type of vessel previously employed is 6¾ tons. They are driven by two 10 h.p. engines of the latest design and will have a speed of about 6¾ knots. They are of very shallow draught and can therefore be used at stations where so far it has not been possible to provide motor boats owing to lack of depth of water.

The *"Royal Silver Jubilee"* is fitted with a Hotchkiss internal-cone propeller. In this device, which has never previously been used in a lifeboat, water drawn in at the apex of a rotating cone-shaped impeller rides up its surface, and is expelled with a greater velocity at its base. This method of propulsion is being used as an experiment in order to decide whether it will be adopted for other lifeboats of this new light type instead of a shrouded propeller.

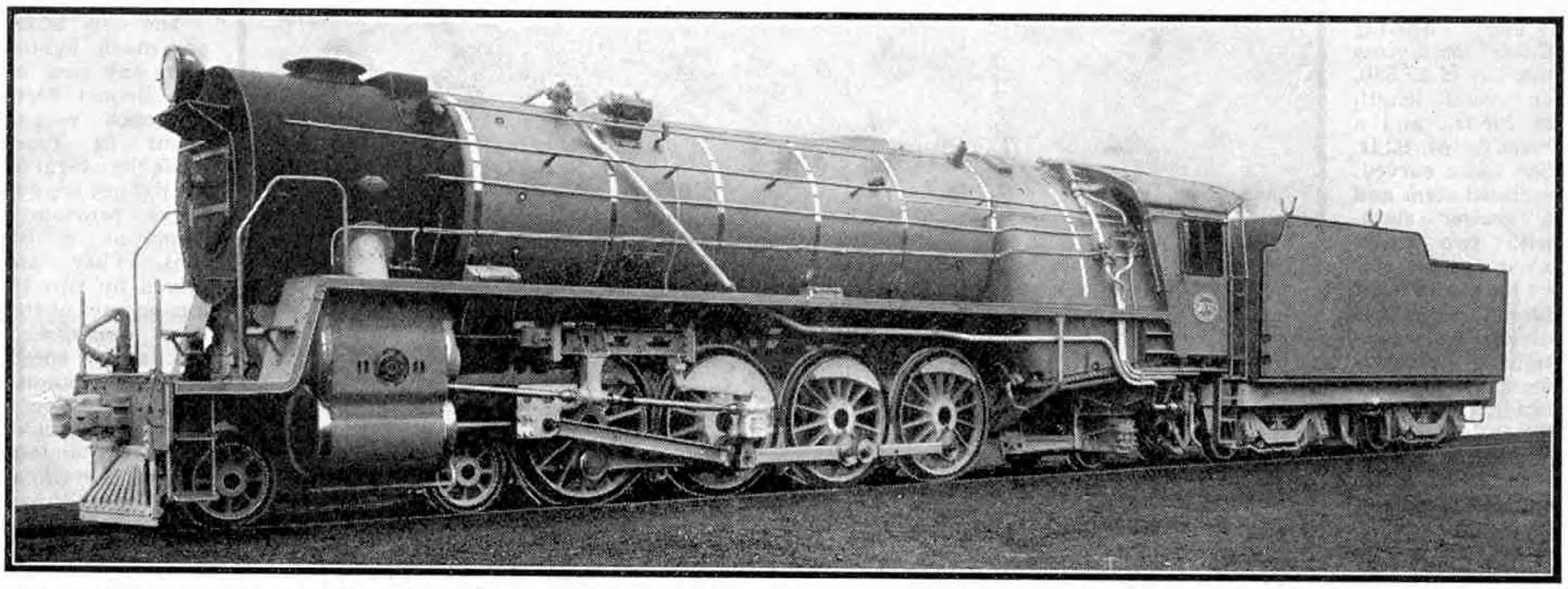
A new motor lifeboat, named *"Sir Heath Harrison,"* commenced service at Port St. Mary, Isle of Man, early last month. She was built by J. Samuel White and Co. Ltd., of Cowes. The new vessel is 36 ft. 6 in. long and 9 ft. 6 in. wide, and has a draught of 2 ft. 1 in. She is of a type specially designed for stations where the lifeboat has to be launched off a carriage or the open beach. In service she weighs 6¾ tons, with the crew of seven and all gear on board.

The *"Sir Heath Harrison"* is built of mahogany and is divided into six watertight compartments with 115 air-cases. She can free herself in 12 seconds of a sea breaking on board. Sufficient petrol is carried to enable her to travel 100 miles at the maximum speed of 6 knots without refuelling, and the fore and mizzen masts are fitted to carry three sails as an auxiliary means of propulsion.

A fourth motor lifeboat, the *"Viscountess Wakefield,"* has been stationed at Hull. The boat is of the beach type and has a speed of 7¾ knots, with a range, at full speed and without refuelling, of 120 miles. Altogether there are now 128 motor and 40 sailing and pulling lifeboats in the active fleet of the R.N.L.I.

New "Mountain" Locomotives for South Africa

Heavy-Duty Mixed Traffic Engines



The illustration above shows one of the large 4–8–2 locomotives recently introduced for heavy passenger and freight service on the South African Railways. They are the largest locomotives of the "Mountain" type in South Africa. Our photograph is reproduced by courtesy of the makers, Robert Stephenson and Co. Ltd., Darlington.

IN the "*M.M.*" for December 1935 we gave details of a new class of 4–6–2 express passenger locomotives then recently introduced on the South African Railways. These engines, classed as "16E," show a great advance in size and power on previous "Pacifics" on these lines. Similar progress is shown by the 4–8–2 or "Mountain" type engines of class "15E" recently constructed by Robert Stephenson and Co. Ltd., Darlington, to the designs of Mr. A. G. Watson, Chief Mechanical Engineer of the South African Railways. These giants are intended for heavy passenger and freight trains and are the largest of the 4–8–2 type in South Africa. They resemble the "16E Pacifics" in their general design and outline. Both classes have poppet valves, and their boilers, except for the necessarily longer barrel of the 4–8–2s, are of the same design.

Each of the two cylinders of the new engines is cast in one piece with half the smoke-box saddle. These cylinders are interchangeable with those of the "16E" class, but in order to make them suitable for the new 4–8–2 "15E" class a cast iron liner or distance piece is fitted between the smoke-box itself and the top of the smoke-box saddle. The cylinders are so designed that the same pattern does for both sides of the engine; thus separate right-hand and left-hand patterns are not required. Steam distribution is effected by rotary camshaft poppet valve gear and many of the main details are interchangeable with similar parts used for the "16E" engines. The camshafts are arranged to admit steam at cut-offs ranging from 15 per cent. to 85 per cent. in full gear. In mid gear the valves are all held open. A by-pass position is provided in order to ensure free running when the engine is drifting.

The cylinders drive on the second pair of coupled wheels through connecting rods of heat-treated steel. These have been designed for lightness consistent with strength, and are of fluted section. The balance weights in the driving wheels are cast with cavities that can be filled with more lead if it should be found desirable to add to the present balancing weight of 20 per cent. of the reciprocating masses. Built-up crossheads are used. The bearings at the main crank pins and the coupling rod pins are fitted with floating bronze bushes. All these pins are hollow and are grease lubricated. Grease lubrication also is provided for the axleboxes.

The leading bogie, with wheels 2 ft. 6 in. in diameter supports a weight of 18 tons 19 cwt. The coupled wheels are 5 ft. in diameter, and the total weight sustained by them is 71 tons 12 cwt. A two-wheeled truck supports the rear end of the engine. The spring suspension is equalised throughout the coupled wheels and the equalisation is continued through to the truck. The main frames are each made in one piece from solid rolled slabs. They are reduced in thickness at the rear end to give clearance required for the side play of the trailing truck.

Steam is supplied from the boiler at a pressure of 210 lb. per sq. in. There is no dome, although the man-hole cover that is visible towards the rear end of the boiler barrel suggests a dome cover. Instead there is an internal steam collector of special design that terminates in a steam pipe connected to the header of the superheater. The boiler is fed by two injectors, placed under the footplate, that deliver the water through top-feed clackboxes on the front ring of the boiler barrel. One of these fittings and the necessary piping are clearly visible in the illustration.

There is a wide fire-box, the grate of which has an area of 62.5 sq. ft. It is fitted with steam-operated shaking gear and a dumping system that enables the fire to be dropped when required. The brick arch is carried by five arch tubes that add to the heating surface and aid in the circulation of the water. The fire-door is steam-operated, and a great part of the fire-box surface is fitted with flexible stays. The fittings include a soot blower that enables the tubes to be cleaned during the course of running.

The steam brake acting on the coupled wheels of the locomotive works in conjunction with the vacuum brake fitted to the tender. A special form of intermediate buffing gear fitted between the two vehicles is designed to minimise the wear of its components, and to promote smooth riding. Complete electric lighting equipment is provided, and the engines are fitted with speed indicators and recorders that are driven from the trailing wheels.

The coupled wheels of the new engines are larger than those of the older 4–8–2 locomotives of class "15CA," but as the boiler pressure is 10 lb. per sq. in. higher. there is little difference in the respective tractive efforts. Increased speeds with the same loads, or greater hauling capacity at the same speeds, therefore should be possible. It is notable that the generally increased capacity of the new engines has been obtained with a very small increase in their empty weight over that of the older class. The wide fire-box also is deep, and to secure this effect the height of the boiler centre is 9 ft. 2½ in. from rail level. This height is remarkable for an engine to run on track of 3 ft. 6 in. gauge, and exceeds that of many main line locomotives in this country.

The tender is similar to those already in service in the "16E" class, and has a capacity for 12 tons of coal and 6,000 gallons of water. It is supported on two four-wheeled bogies and weighs 66 tons 3 cwt. in working order. The total engine weight is 107 tons 14 cwt., so that the combined weight of the engine and tender in working order is 173 tons 17 cwt.

The appearance of these engines has practically coincided with the announcement that Mr. A. G. Watson, their able designer, is shortly to retire. During his term of office as Chief Mechanical Engineer of the South African Railways, the standard of efficiency of motive power and rolling stock has constantly risen, and extensive workshop and other improvements have been effected.

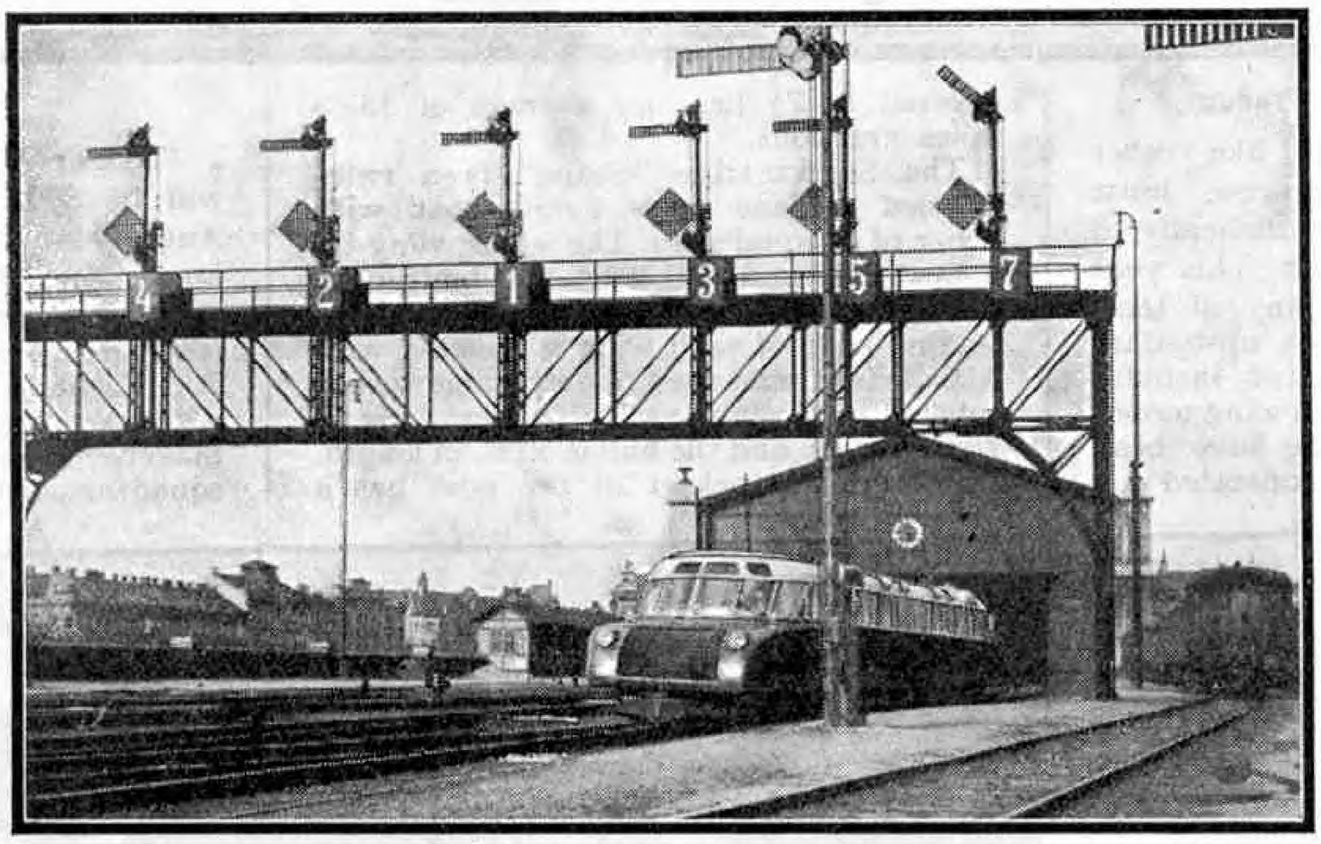
Rail Car with Pneumatic Tyres

Streamlined Vehicle for High-Speed Services

By H. F. Kutschbach

UNTIL comparatively recent years rail cars, driven chiefly by steam, conformed largely in their design and construction to the robust standards required of vehicles intended for general railway service. The altered requirements of modern times, and the continued development of the internal combustion engine, have resulted in the introduction of the lightweight high-speed rail car, which approximates in its construction to the standards observed in road motor coaches.

The impact of steel tyres on rail joints necessitates a heavier construction for a rail-borne vehicle than for a similar type for use on the roads, where advantage can be taken of the cushioning effects of rubber tyres. On this account many attempts have been made to adapt pneumatic tyres to railway vehicles, and particularly to rail cars. The area of contact of such a tyre is greater on the road than on the rail, however. In the former case this area can vary with the pressure on the tyre, but no such variation is possible with rubber tyres running on rails, and the load that can be imposed on them is restricted, especially on small-section rails. Several schemes therefore have been devised for employing rubber for the sake of its cushioning effect as part of composite wheels running on the usual steel flanged tyre.



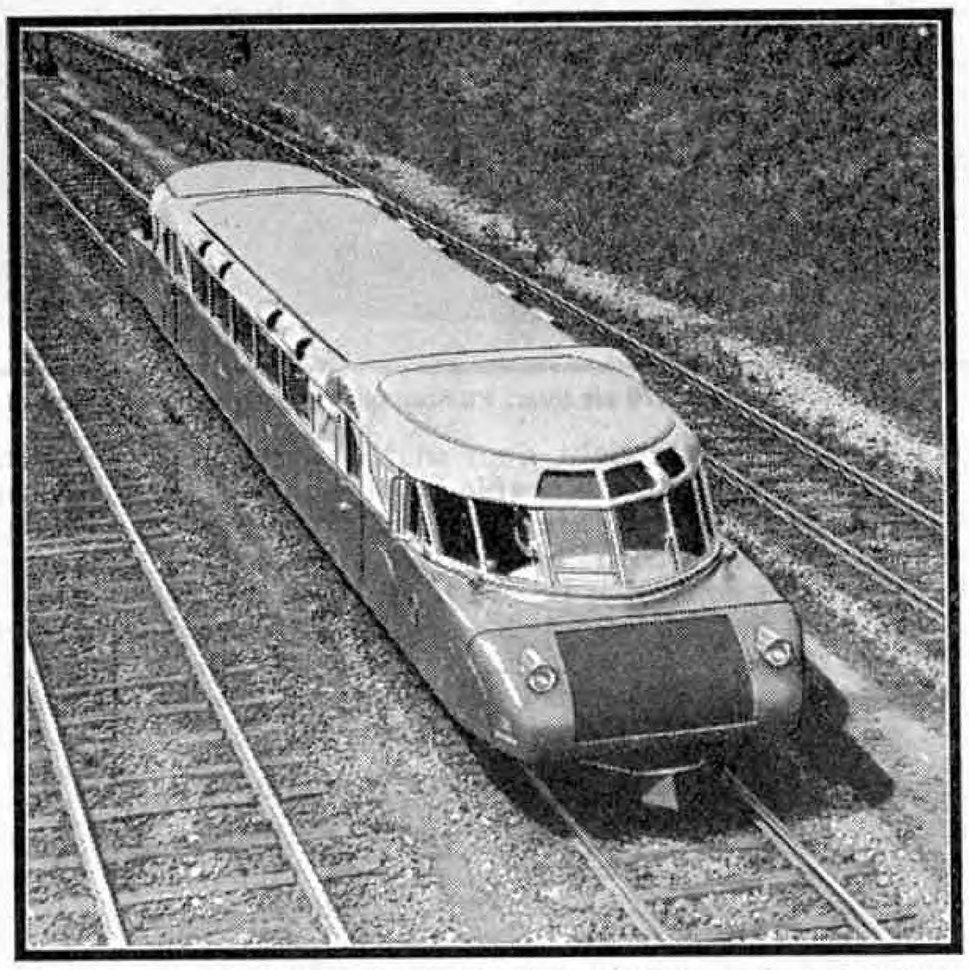
The rail car described in this article leaving a station. The low construction of the car is of advantage for entraining passengers where there are no platforms, or only very low ones. Photographs by courtesy of the makers, Austro-Daimler Puchwerke A.G., Vienna.

An interesting method of making use of pneumatic tyres in conjunction with the usual steel-tyred wheels is applied in the streamlined rail car illustrated on this page, which has recently been put into service in Austria. The work of guiding this vehicle on the track is performed by wheels with steel tyres of the standard railway type, but the load is cushioned by pneumatic tyres that bear on internal cylindrical surfaces formed in the steel wheels. The latter are mounted on hollow axles, through which pass the axles on which the pneumatic-tyred wheels are fitted. These axles support the car body in the usual manner. Thus the running shocks sustained by the steel tyres of the track wheels are taken up by the pneumatic tyres and cannot be transmitted to the car itself, as there is no direct metallic contact. The load-carrying axles receive their motive power through the medium of bevel gears, and transmit the movement to the track wheels by means of the pneumatic tyres.

This system allows air-filled tyres of practically any size to be used, and therefore permits of increased carrying capacity. The load supported by each pneumatic tyre is not restricted by the small contact area on the rail head. Actually the conditions are much more favourable to cool running and long life than those in which pneumatic tyres are run normally on the road, for the cylindrical surface within the track wheels on which the tyres bear is very wide. It is found that the tyres keep cool during continuous high-speed runs of several hours' duration.

It is possible to continue running even with a flat tyre, and there need be no disorganisation of schedules from this cause. If a tyre becomes flat, perhaps because of a defective valve, then the carrying axle affected sinks a distance of about an inch within the hollow axle of the corresponding steel wheel. Only in these conditions is any proportion of the weight of the car carried on one of the axles of these wheels, and no weight is then imposed on the flat tyre, so that continued operation is possible without any danger.

With the adoption of pneumatic tyres for load-carrying duties it has been possible to employ lightweight construction in the chassis and body of the car, so that a low dead weight in relation to the number of passengers is realised. A streamlined outline has been adopted not only for its publicity value, but also on account of the higher maximum speeds made possible and the reduced running costs, as compared with the normal type of rail car. A low centre of gravity has been attained by placing the lattice girder forming the chassis with its lower beam passing under the axles and its upper beam just above them. In addition to the safety this low construction affords, it has the advantage of giving easier entrance from the ground or from low platforms. The lattice girder referred to is built up of pressings of high tensile strength, a form of construction that allows of sound design with the minimum of material, and a saving in weight also is realised by the use of welding in its fabrication.



Another view of the car, showing its streamlined form. A good outlook is ensured by the generous provision of windows.

The car is driven by a six-cylinder 80 h.p. engine of sturdy construction that is specially suitable for heavy duty. The grouping of the cylinders and other parts is so arranged as to permit of the easy removal of the pistons without undue dismantling of the engine. All engine parts that require regular overhauling, such as the water pump, camshaft, and the oil pump, are arranged to be demountable without disturbing adjacent units.

Hydraulic transmission is employed, with oil as the motive fluid, and the system is characterised by high efficiency, extremely gentle starting and excellent responsiveness generally. This has been achieved by the combination of a hydraulic coupling or clutch for direct drive and hydraulic reducing gear for acceleration and uphill work.

To save weight without reducing strength the car body is formed as a single unit with the chassis. The body pillars of steel sections are riveted to the side members of the chassis, the body framework generally being built up by welding and riveting.



New Aircraft for Air France

Air transport companies, like other forms of commercial enterprise, must modernise their equipment periodically to keep pace with developments. This year Air France are replacing many of their aircraft with faster and more up-to-date machines. The new equipment includes 20 Potez 62 twin-engined high wing monoplanes, and several of them have been delivered. Various services operated by the company will benefit, as six of the Potez 62s will be used on the London-Madrid route, seven on the Damascus-Hanoi portion of the Far East route, and several on the company's European air lines. The South American service of Air France is to have four of the aeroplanes, three of which will operate over the Natal-Buenos Aires stretch and one over the trans-Andean portion of the route.

The Potez 62 carries 14 passengers in a two-part cabin, six of them occupying the front portion and the remainder the rear one. It has a span of 73 ft. 7½ in. and its six fuel tanks are inside the wing. The two engines normally fitted are Gnôme-Rhône K 14s, which give it a top speed of just over 200 m.p.h., and 16 of the 20 Potez aeroplanes ordered by Air France will have this type of engine; the other four will have Hispano Suiza 12-XBRS-I engines. The engines are carried in nacelles slung beneath the wing.

Air France also have ordered six Caudron monoplanes, which will be used on their Africa service. These aeroplanes have two 220 h.p. Renault engines and cruise at 167 m.p.h. The passenger cabin seats six persons. Three triple-engined Fokker aeroplanes also have recently been acquired by the company.

Fine Flight by Supermarine "Scapa"

One of the Supermarine "Scapa" flying boats of No. 202 (Flying Boat) Squadron of the R.A.F., stationed at Malta, recently flew to Gibraltar, calling at Algiers on the way. The return flight was made non-stop, however, and the 1,000 miles were covered in 7½ hrs., an average of 133.3 miles per hour.

The Supermarine "Scapa" is a twin-engined biplane type flying boat with wings of unequal span. The wings, wing-tip floats, hull and tail unit are built of a specially treated aluminium-alloy, and the leading edge of each wing is covered with Alclad sheet, and the tail unit framework is covered with fabric. The upper wing is 75 ft. in span and the hull is 53 ft. in length. The gunner's cockpit in the nose has a hinged watertight door in the front that can be opened to enable bomb-sights to be taken. There are two other gunners' positions, both behind the wings. The pilot's cockpit is just in front of the wings, and immediately behind it are the navigator's, engineer's and wireless operator's compartments. No details of the performance of this flying boat are available.



Passengers entering a Savoia-Marchetti S.74 air liner. Photograph reproduced by courtesy of Agence Bruni.

First Atlantic Flight of "*Hindenburg*"

The new Zeppelin, christened "*Hindenburg*," has completed her first flight to South America. She left Friedrichshafen at 5.32 a.m. on 31st March, with Dr. Eckener in command, and with 50 passengers and a crew of 46 on board. No attempt was made to accomplish the Atlantic crossing in record time, and South America was reached by the 3rd of April. After flying down the coast of Brazil the "*Hindenburg*" landed at Rio de Janeiro at 9 o'clock next morning.

R.A.F. Vacancies

The Air Ministry announce that there will be 800 vacancies in the R.A.F. in August for boys for training as aircraft apprentices. Those accepted will be given three year's training by qualified technical instructors in the more highly skilled R.A.F. trades of fitter, fitter (armourer), wireless operator mechanic or instrument maker, before being appointed to a squadron. During training the general education of the apprentices will be continued under a staff of graduate teachers.

Applicants must be between 15 and 17 years on 1st August 1936, and must pass an entrance examination that will be held on 26th of this month in London and many provincial centres. The subjects set will be English, Mathematics, Science and General Knowledge. Boys who possess approved School Certificates with specified credits may be excused this examination. Full particulars can be obtained from the Inspector of Recruiting, Royal Air Force, Victoria House, Kingsway, London, W.C.2, and nominations for the examination must be received by Tuesday next, 5th May.

In September next there will be 200 vacancies for Boy Entrants for training as photographers, wireless operators and armourers. Boys between 15¾ years and 17¼ years on the 1st of that month will be eligible, provided they have attended a secondary or junior technical school or central school up to the age of 15½, or have attained an equivalent educational standard. There is no entrance examination and no previous experience is required. Full particulars can be obtained from the Inspector of Recruiting at the address already mentioned.

Blackburn "Sharks" for Portugal

The Portuguese Government have bought six Blackburn "Shark" torpedo spotter reconnaissance machines (seaplane version) for the Naval Air Service of that country. The "Shark" is fitted with an Armstrong Siddeley "Tiger VI.C" engine, and has a top speed of 152½ m.p.h.

Imperial Airways' Summer Services

The Continental services of Imperial Airways have been augmented to cope with the heavy summer traffic. There are now five flights in each direction every day on the London-Paris route, and four services daily to Cologne, three to Brussels and two to Switzerland. Fast aircraft bring Prague, Vienna, Budapest and Brindisi within a day's flying of London. The main European airway system now comprises about 30 companies operating over more than 60,000 miles of routes, and Imperial Airways' summer services, by establishing connections on the Continent with this great system, enable passengers from London to travel by air to about 200 European towns and cities. Connections also are established between the system of internal air services in this country and the main Continental and Empire routes. As an instance of this co-operation, passengers leaving Manchester by air at 10 a.m. can catch a connection at Croydon that enables them to reach Paris by 2.45 p.m., Brussels 15 min. later, and Cologne by 4 o'clock the same afternoon.

The summer service between London and Switzerland is being operated in co-operation with Swissair, as last year, but is an improvement upon previous schedules. Imperial Airways' machines now omit the call at Paris and fly non-stop to Basle, in $3\frac{3}{4}$ hrs., and Zurich is reached 40 min. later. Swissair make the trip from Zurich to Croydon in 3 hr. 50 min. On the Swiss aerodrome air-taxis are available that enable visitors to obtain splendid bird's eye views of the Alps in a flight lasting from $\frac{1}{2}$ hr. to $\frac{3}{4}$ hr.

Many facilities are provided in combined week-end trips by air and land. Leaving London on Friday evening, the holiday-maker can fly to Germany, enjoy special steamer excursions up the Rhine, and be back in London by Sunday evening. Similar trips, in which air and land transport are combined, enable week-end parties to make air-and-rail excursions along the Belgian coast; and in an air holiday lasting about a week it is possible to make flights right round Europe, with ample time on the ground for incidental sightseeing. There are also combined excursions, in which part of the journey is made by aeroplane and part by ocean liner. In this way one can fly across Africa, obtaining air views of forests, deserts, and wild life in its natural surroundings, and then return by sea in one of the liners leaving Capetown for England.

The American "Crusader"

The Ag-4 "Crusader" shown in the upper illustration on this page is an interesting departure from the usual type of cabin monoplane. The streamlined fuselage is so short that the tail unit is fitted to the rear ends of two long tapering "tail booms" that extend past the fuselage. The other ends of these tubular booms are just in front of the leading edge of the wing and are utilised as nacelles for the two 125 h.p. Menasco C4-S engines. The "Crusader" has a top speed of 233 m.p.h., and a cruising speed of 210 m.p.h. It is produced by the American Gyro Company, of Denver, California.

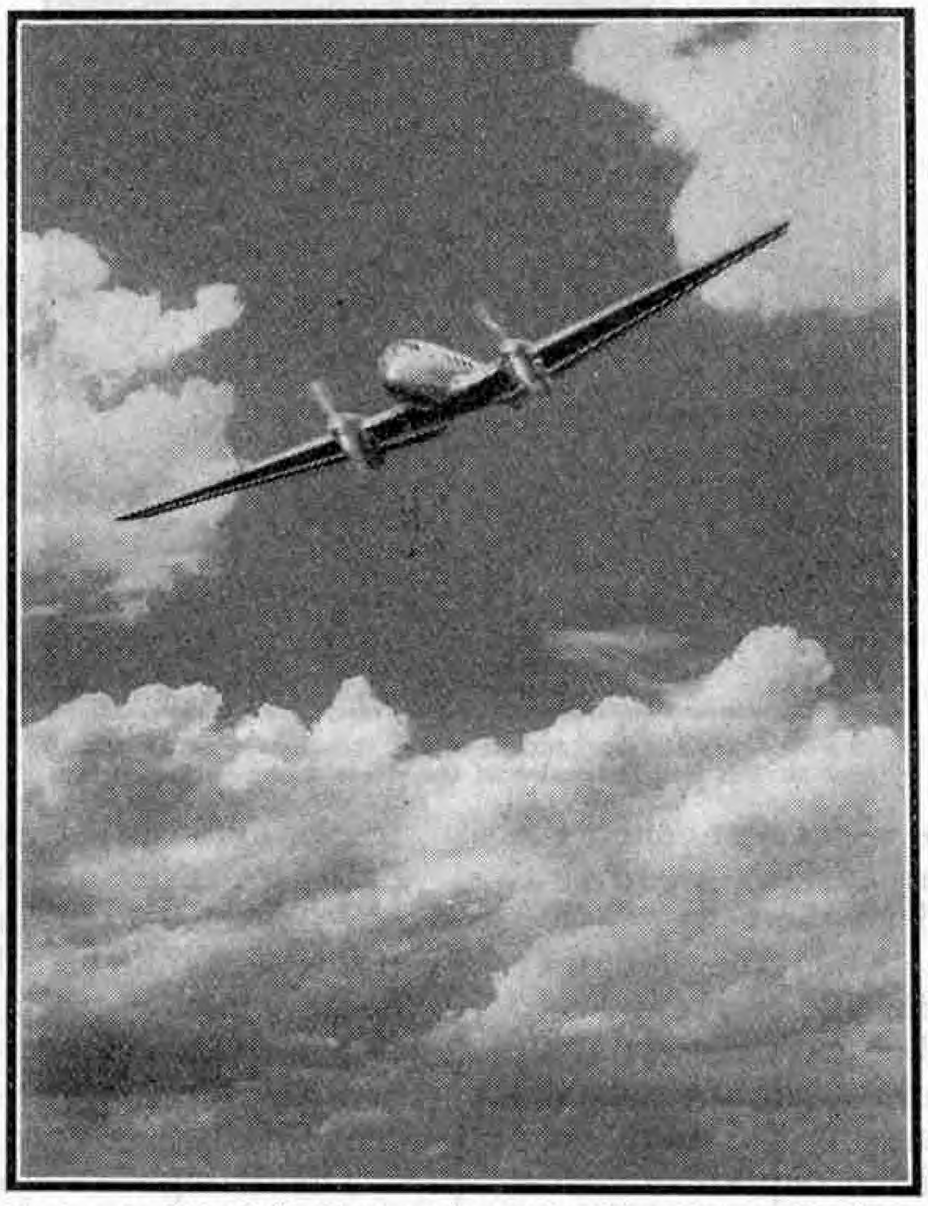
The wing is built up of steel spars and is covered with stressed aluminium-alloy sheeting, and the fuselage also is of metal and covered with a light alloy. The neat and compact cabin normally provides seating for a pilot and three passengers, but it can be arranged to accommodate five people. In addition to dual control, full night and cloud-flying equipment is installed. The "Crusader" has a span of 36 ft., a length of 21 ft. 8 in. and a height of 7 ft. 3 in.



The American "Crusader," a novel type of low wing monoplane in which the tail unit is mounted at the end of long, tubular booms. Photograph reproduced by courtesy of "Les Ailes," France.

Diesel-Engined Monoplane for Swissair

The latest addition to the extensive fleet owned by Swissair is a Junker Ju 86 high-speed monoplane, which is of special interest because it is fitted with two water-cooled Diesel engines. The engines are Junkers-Jumo 5s and give the monoplane a top speed of 195 m.p.h. The lower illustration on this page shows a Ju 86 in flight.



Junkers Ju 86 in flight. Photograph reproduced by courtesy of Junkers-Flugzeugwerk A.-G., Dessau.

Notable Air Events this Month

Empire Air Day was inaugurated last year by the Air League of the British Empire to give the public an opportunity of seeing for themselves what civil aerodromes are like, and of inspecting at close quarters the types of aircraft in use there. The co-operation of the R.A.F. extended this privilege to cover many R.A.F. stations, and the success of the joint project exceeded all expectations. This year Empire Air Day will be held on Saturday, 23rd May, and the R.A.F. will co-operate with the Air League in providing excellent facilities for the public to get into close touch with aviation. As last year many flying clubs will help by impromptu displays to make the day a very enjoyable one for visitors to aerodromes.

A week later the Isle of Man air races will provide another great attraction. There will be two races promoted by the Corporation of Douglas, and they will be open to both British and foreign pilots and aircraft. The first race will be flown on Saturday, 30th May, for prizes of £100, £70 and £30. The course mapped out is from Hanworth Aerodrome, Middlesex, to Ronaldsway Aerodrome, near Douglas, in the Isle of Man, with turning points on the way at Hooton, Blackpool, St. Bees Head and Maughold Head.

The second race will be flown on Monday, 1st June, and in this case there will be prizes of £50, £35, £25 and £10 respectively for the four best performances. The course consists of three successive circuits of the Island, the race beginning and ending at Ronaldsway. The turning points, other than the starting and finishing points, will be Douglas Bay, Maughold Head, Bride, Peel and Tynwald Hill.

New System of Naming Imperial Airways Fleet

Up to the present each class of aircraft in Imperial Airways' fleet has been known by the name of the first machine of that class to be put into service. With very few exceptions the aeroplanes in each class bear names beginning with the same initial letter, and that letter also is the initial of the makers of the aeroplanes concerned. The "Hannibals," for instance, were produced by Handley Page Ltd., the "Atalantas" by Armstrong Whitworth Aviation Ltd., and the "Scipios" by Short Bros. (Rochester and Bedford) Ltd.

This system is to be replaced by one in which the names of the makers of the aircraft will have no bearing upon the names chosen for each class, and what is described as "an alphabetical class sequence" is to be adopted. In this the initial letters A and B will be allocated to the existing fleet, with the exception of the 12 "Diana" class air liners, which will be known as "D" class. The letter "C" is to be reserved for the flying-boats now being built for Imperial Airways by the Short company, and the letter "E" for the land monoplanes under construction by Armstrong Whitworth.

The letter "M" has been allocated to the Mayo composite aircraft under construction at the Short factory.

Sand Rivers of the Zambesi Valley

Water Buried in the Beds of Streams

By Wilfrid Robertson

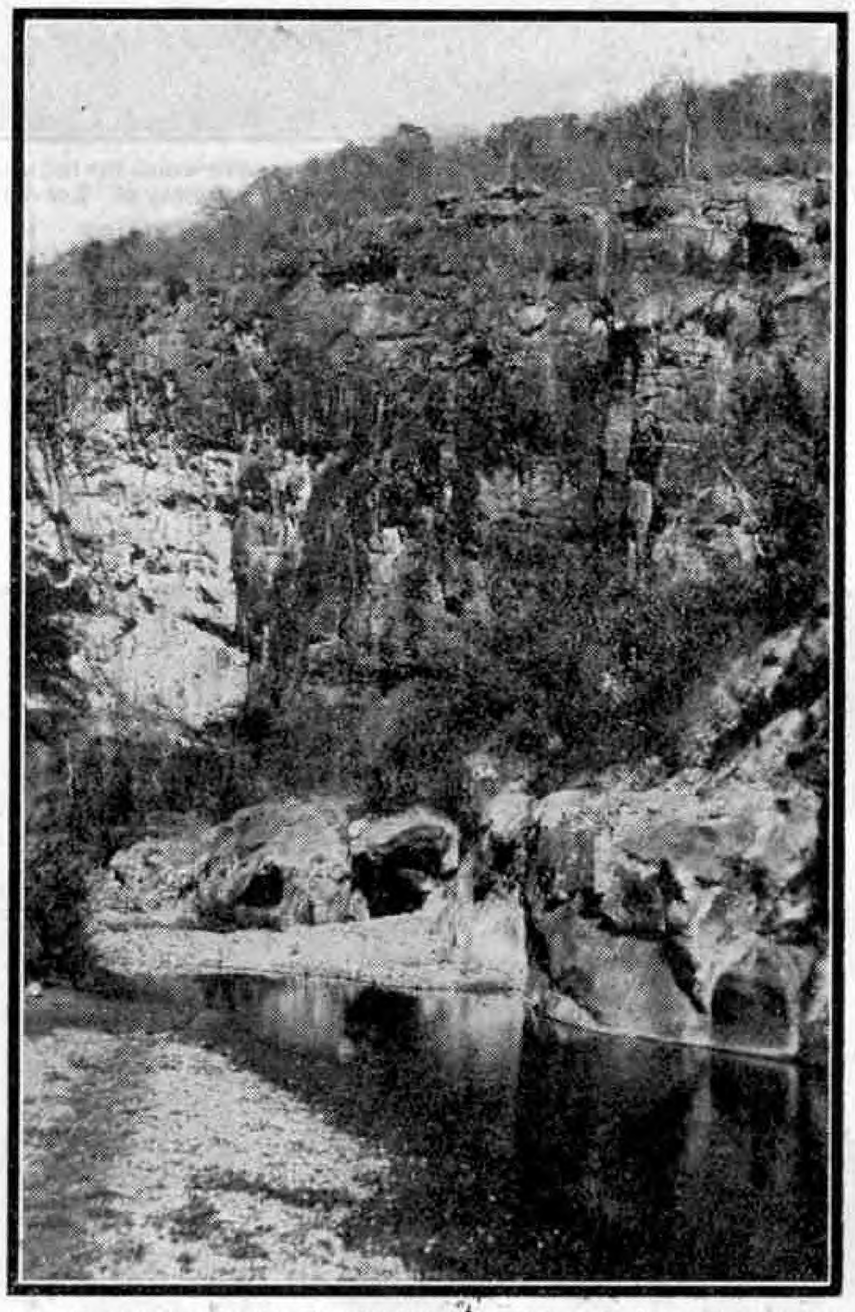
WHERE rivers are concerned, the usual order of things is that the farther one goes downstream the greater is the flow of water; but in the Zambesi Valley country, the wild and elephant-haunted territory in which I have wandered and hunted for many years, the reverse is the case. On the plateaux where they rise the water-courses start as rivers in the accepted sense, although their flow may be attenuated in the dry season. When they descend into the wide belt of low country bordering their destination, the Zambesi River, however, they alter completely in character, and except in the height of the rainy season there is no water in them to reflect the passing clouds or the torrid arc of sky.

Until one becomes used to them, there is something disconcerting about the Valley rivers. This is best realised on reaching one after a long and thirsty day's march, during which the guiding path leads through the close-growing mopani forest, with its hundreds of giant baobabs, and through belts of country covered with jessi-bush that only a rhinoceros can penetrate. Abruptly the mopani gives way to altogether different vegetation. Masses of dense foliage show in front, mighty timber clad in bright metallic green. Beyond the deep cool shade of the trees are reeds with stems 10 ft. high, whose feathery cream-coloured heads sway slowly in the breeze. The river bank appears. All the accessories of a river are there, among them the shady trees, cool reeds, and tall overhanging palms; but between the banks, instead of flowing water, is a level sheet of dazzling yellow-white sand. As if in mockery of the thirsty traveller, the heat flows pellucid just above the surface, in ironical imitation of the water that should be there.

At the beginning of the world, when the tributary rivers cut their way down from the higher ground and gouged out their beds in the soft soil of the Valley on their way to the Zambesi, streams of water no doubt reflected the blue of the sky. During the passage of untold years the beds have slowly been filled with a deposit of coarse and well-washed sand, which hides the flow from sight and protects it from the evaporating power of the Sun.

Although the water cannot be seen, its presence is revealed by the deep-rooted trees and reeds. Slowly it filters onward, deep beneath the sand, appearing only when the river passes through rocky hills. There the deposit has had no chance to settle, and the stream becomes visible, running swiftly between the glistening water-polished masses of bed-rock, to vanish instantly when it again reaches level country.

There are villages on the banks of the river, and their inhabitants depend for their water supply during the long dry season on a deep hole scooped in the sand of the river bed. As the Sun sinks, the women of any one of these villages, each bearing on her head a large red earthenware pot, can be seen trudging in single file down the slope from the huts, to push through the reeds and congregate round the cavity in the sand. With the help of a large spoon-shaped calabash the water is laboriously baled out and poured into the pots. By the time all are filled the hole is dry, but an hour will see the bottom again covered with freshly filtered water. The women lift the jars on to their heads and turn away, leaving the children to cover the hole with branches to protect it from being fouled and trodden in by animals.



In a deep gorge in the Zambesi Valley. It is only in rocky country such as this that the water of the rivers comes to the surface.

Wild creatures normally drink at places in the rocky country, where the water is forced to the surface. They are well aware of its existence beneath the sheets of sand, however, and where the overlay is thin they scrape it away with their feet. I have at times come on remarkably deep holes made by thirsty beasts, into which the water has percolated, thus saving my carriers the labour of digging at the end of a long day's march.

A considerable amount of the Valley country is covered with almost impenetrable bush, a close-knit tangle that can be traversed only along the age-old twisting tracks made by elephant and rhinoceros. None of these paths leads in one direction for more than a few yards, and their use is not unattended with danger to the human traveller. While he is hemmed in between the nearly solid walls of such a track, at a yard's range he may meet an elephant or a rhinoceros strolling in the opposite direction. Someone has to give way, and it won't be the animal that will oblige!

The straightest and best roads through the jungle-country therefore usually are along the sandy beds of the rivers. Loose ankle-deep sand is a particularly exasperating surface on which to travel. With each stride forward the foot slips half a step backward, doubling the labour and making marching a monotonous treadmill. Even when travelling light it is hard work, and the toil is considerable to anyone laden with a heavy express rifle, ammunition

and water-bottle. The bare feet of the native bearers grip the surface better than do a white man's boots, but it is not long before even the natives begin to stagger and pant beneath their head-borne loads. To make matters worse, the Sun seems to concentrate upon the river beds. Heat beats down from above and is radiated upward from the dazzling surface, and the tree-clad banks of the river shut out any possible cooling breeze.

Under the midday Sun the watercourse appears to be flat and featureless, a glaring level of eye-searing sand. At the hour of dawn it is as revealing as an open book to those who can read it, however, for it speaks of the creatures that inhabit the district, of their numbers and their movements. As the Sun rises, its golden light catches the tops of the trees that line the river bank. Swiftly the rays descend, falling on the sheet of sand and turning its pale dun to dazzling whiteness. The slanting beams pick out each hollow and footmark, and impressions now show in bold relief that would be almost invisible at midday, when the Sun is directly overhead.

The great round marks of the feet of a herd of elephants stand out like gigantic enlargements of the perforations on a sheet of postage-stamps, each depression bordered by a half-moon of blue shadow on its eastern side and a clear-cut white line on the west. Crossing them is a series of V-shaped spoor, telling of the passage of a herd of sable antelope; and beside them are those of the small feet of a troop of impala. Lion, buffalo, zebra, all have left their footprints, and even the tiny three-toed marks of guinea fowl, francolin and other birds show beneath the overhanging trees, where the sand is damper. As the day advances the wind will blur the impressions; at dawn the marks of the feet of those that pass in the night stand out clear and sharp.



On the march along the sandy bed of a Rhodesian river. The water is below the bed and is reached by digging.

Every 12 or perhaps 20 miles along their sinuous course these rivers pass through belts of rocky country, winding about in deep gorges carved out by the flow of water for untold centuries. In one of these belts there is a ravine in which I have often had to camp in my journeyings. The stream runs strongly along its bottom, hemmed in by a thin line of dense jungle backed by vertical cliffs of rock from which hang festoons of maidenhair fern, and provides the only water that is accessible for miles around.

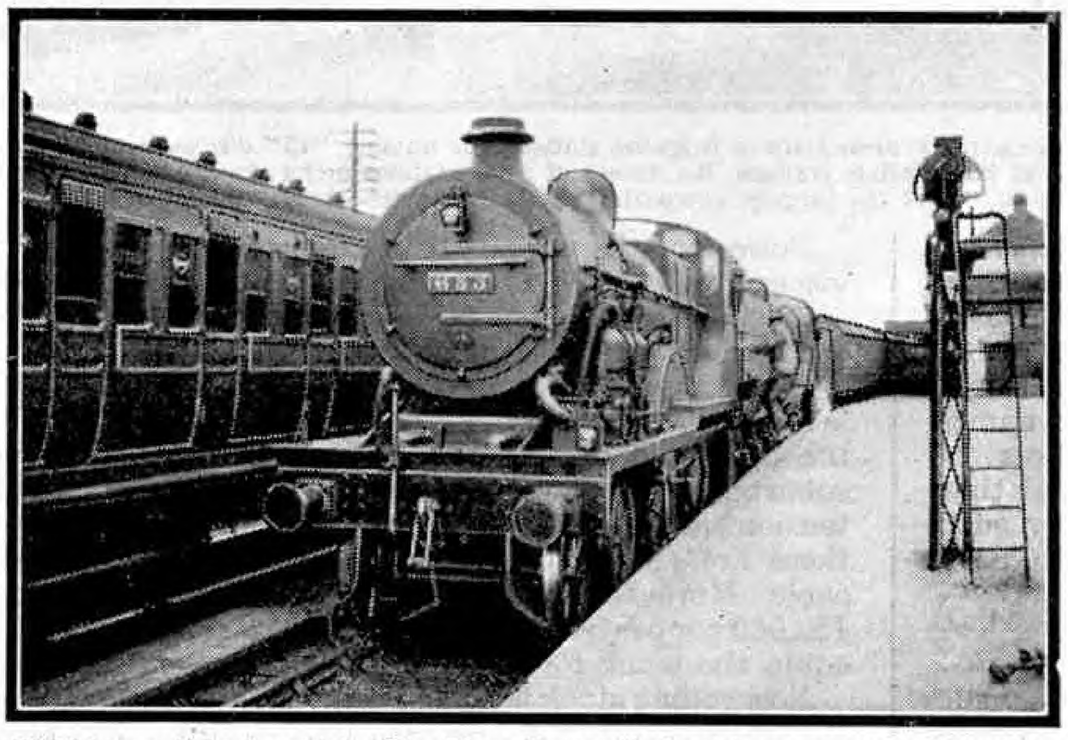
At night the spot was never a restful one, for with the coming of the dark the place became a veritable Zoo. Lions and elephants, buffalo and rhinoceros were among the visitors of many kinds. A ring of fires had to be kept burning at night, and a regular system of native sentries arranged. The flickering flames kept most of the callers from actually blundering into the camp; but it was disconcerting to be awakened suddenly by the heavy breathing or inquisitive snorting of some intruder standing in the darkness just beyond the circle of the light.

Trains that Arrive in Reverse

Although motor trains of the "push-and-pull" type perform half their journeys with the coaches leading, the arrival of a main line train at a station platform with the engine trailing sounds unusual. Yet this can be observed regularly at Limerick Junction in Ireland, and also at Inverness, as described on page 256 of this issue, and expresses from the southern extreme of the territory served by L.M.S.R. trains arrive at Templecombe in reverse, while those in the opposite direction depart from that station with their engines in the rear.

"*The Pines Express*," with its Liverpool and Manchester, Leeds and Bradford portions, makes part of its journey to and from Bournemouth over what was in pre-grouping days the Somerset and Dorset Joint Railway. This is now a jointly-owned L.M.S.R. and S.R. system. Its main line runs from the L.M.S.R. station at Bath to the S.R. system at Broadstone Junction, whence access is afforded to Bournemouth. The S.R. West of England main line is touched intermediately at Templecombe, for the L.M.S.R. trains make use of the S.R. station there. A steeply-rising spur connects the "Joint" line, which passes underneath the S.R. main line at right-angles with the station.

"*The Pines Express*," southbound, leaves the Joint line at Templecombe No. 2 Junction, and curving round to the right gains the platforms of Templecombe station. Its station business being discharged, there is no way for the train to regain its former route except by setting back out of the station over the spur that it has previously negotiated. For this reversing movement a shunting pilot engine is attached to what becomes, temporarily, the front of the train. Thus the heavy express, frequently double-headed in the Summer season, makes its departure from Templecombe with its own engines trailing. At No. 2 Junction the shunting pilot is detached and the train then proceeds on its way again.



"Right away"-backwards! "The Pines Express" about to reverse out of the S.R. station at Templecombe. The headlamp indication is that authorised for expresses on the Somerset and Dorset line. Photograph by Mr. H. M. Madgwick, Worthing.

The opposite process is necessary with the northbound train from Bournemouth. It reverses at No. 2 Junction and after the pilot has been attached in the rear it is shunted back up the incline into the station. The resumption of its journey is simple, for departure is made in the usual way with the train engine leading, the pilot engine being left at the station.

This train, and indeed all through services to and from the L.M.S.R. system proper, have to reverse at Bath, for the L.M.S.R. station there is a terminus. The engine of either a northbound or a southbound train runs in up to the buffer stops and is uncoupled. In the meantime a fresh engine is attached to the other end of the train and the next stage of the journey is commenced. When this reversing process, the adventures at Templecombe, and the heavy gradients and single-line working of the Somerset and Dorset route are borne in mind, it will be realised that good locomotive work is demanded, especially as no larger passenger engines than L.M.S.R. 4–4–0's of class "2P" are used.



"Lloyd's"

The G.W.R. "Castle" class locomotive, formerly No. 4009 *"Shooting Star,"* that we mentioned last month as having been renamed *"Lloyd's"* and numbered "A1," has since had its number changed to *"100 A1."* This is more appropriate, as it brings the engine into line with the highest classification in Lloyd's Register of Shipping.

There has recently been scrapped at Swindon Works No. 3345, *"Smeaton,"* of the 4–4–0 "Bulldog" class. It was originally No. 3357 and was named *"Exeter."* In March 1902 it was selected to haul the Royal Train from Newton Abbot to Plymouth where their Majesties King Edward VII and Queen Alexandra were to launch the battleship *"Queen"* at Devonport, after visiting Dartmouth to lay the foundation stone of the new Naval College for cadets. The name of the engine was then altered temporarily to *"Royal Sovereign."* Such alterations were a favourite G.W.R. practice for special occasions and the engine used for the run from Paddington to Kingswear, and the return from Plymouth, was specially named *"Britannia."* Its usual name was *"Baden Powell,"* but later in the same year it became *"Kitchener"* for another special occasion! It was one of the now obsolete 4–4–0 "Atbara" class.

The change of name of No. 3345 from *"Exeter"* to *"Smeaton"* recalls the removal from G.W.R. locomotives of place names that might be confused with those of stations on the system. It was found that travellers were sometimes misled by such names. Since its building in 1900 No. 3345 had run 1,170,839 miles.

New G.W.R. Rail Cars

Numerous additions have been made recently by the G.W.R. to the services operated by streamlined rail cars. New cars of the same general design as their predecessors are in use, but they have larger and lower observation windows giving increased visibility. Sliding doors replace the swing doors of the earlier cars. A total of 95 services is operated by streamlined rail cars on the G.W.R., and it is announced that further additions are shortly to be made.

The Portsmouth Electrification

Rapid progress is being made with the electrification of the S.R. main line to Portsmouth. When completed the through line will cover 74 route miles and will be one of the longest stretches of electrified track in the country. The electrical equipment in the 26 substations will be similar to that provided on the Brighton and Eastbourne routes. It will be automatically controlled from the control rooms that are being installed at Woking and Havant.



A Southern electric express train in Brighton station. The number "15" displayed in front shows that the train stops at intermediate stations, the names of these stations being given on the indicator at the side of the luggage compartment. (H.R.C. prize-winning photograph.)

Power for the operation of the new services outside the Western Section suburban area will be obtained from the substations of the Central Electricity Board at Woking and Portsmouth. The S.R. power house at Wimbledon is being extended to provide for the operation of the new services in the suburban area. The total length of high-tension cable to be laid is over 100 miles and there are about 10½ miles of low-tension cable. More than 139,000 insulators and 150,000 copper bonds will have to be used to equip the track for electric working.

New rolling stock is being constructed for the operation of the services. This will include 48 four-coach units, 19 of which will be provided with a car that will include kitchen and dining accommodation for 3rd class passengers. Running in conjunction with it will be a 1st class coach including both compartments and saloon accommodation for diners.

Station alterations, further sidings and cleaning sheds, and additional repair facilities are being provided as part of the scheme.

Speeding by a "Sandringham"

Over the main line of the Great Central section of the L.N.E.R. the express that carries the Penzance-Aberdeen through coaches is timed at the same speeds as the crack expresses from Marylebone, and in consequence the fastest running of this lengthy through journey occurs on G.C. metals. On a recent occasion No. 2835 *"Milton"* of the "Sandringham" class made some fast running north of Leicester, with a gross load of 275 tons. A permanent way check to 35 m.p.h. was in force three miles from the start, but despite this No. 2835 was through Loughborough, 9.8 miles, in 12½ min. at 80½ m.p.h. After a minimum speed of 64 m.p.h. up the 3-mile rise at 1 in 176 to Barnston signal box, a second maximum of 80½ m.p.h. was reached at Ruddington and the 23.4 miles from Leicester to Nottingham were completed in exactly the 25 min. booked.

Very hard work is needed on the next stage owing to heavy gradients and numerous slacks. A speed of 42 m.p.h. was sustained up the 1 in 130 bank past Annesley, and 73 m.p.h. was touched before Staveley; but the 38.2 miles from Nottingham to Sheffield took the full 48 min. Sheffield an ex-Great Northern "Atlantic" took charge.

We are indebted to Mr. O. S. Nock for these timings.

Increasing Use of Colour-Lights

Improved traffic working between Carlton Road Junction and Finchley Road will result from the replacement of the present semaphore signals by colour-lights. This section of the Midland main line out of St. Pancras carries a very heavy traffic. Main line trains to and from the North and suburban trains to Mill Hill, St. Albans, and other stations work over the line. It is situated entirely in cuttings or in tunnels, including the Belsize Tunnel, 1,822 yards long. Certain alterations are to be made in the placing of the new signals.

At Leeds (New) Station a new colour-light signalling installation is almost complete.

The renewal of signalling apparatus and the installation of colour-lights is to be effected during the year on L.N.E.R. lines in the neighbourhood of Newcastle-on-Tyne.



Locomotive Standardisation on the L.M.S.R.

Since the formation of the L.M.S.R. group in 1923 considerable progress has been made in locomotive standardisation. The locomotives belonging to the constituent companies totalled 10,316, and these were divided into 393 types. Progress has been such that at the end of 1935 the number of types had fallen to 185 and the total number of locomotives to 7,885. When the orders at present in hand are completed the number of types will fall to 150 and the total stock of engines will be 7,554.

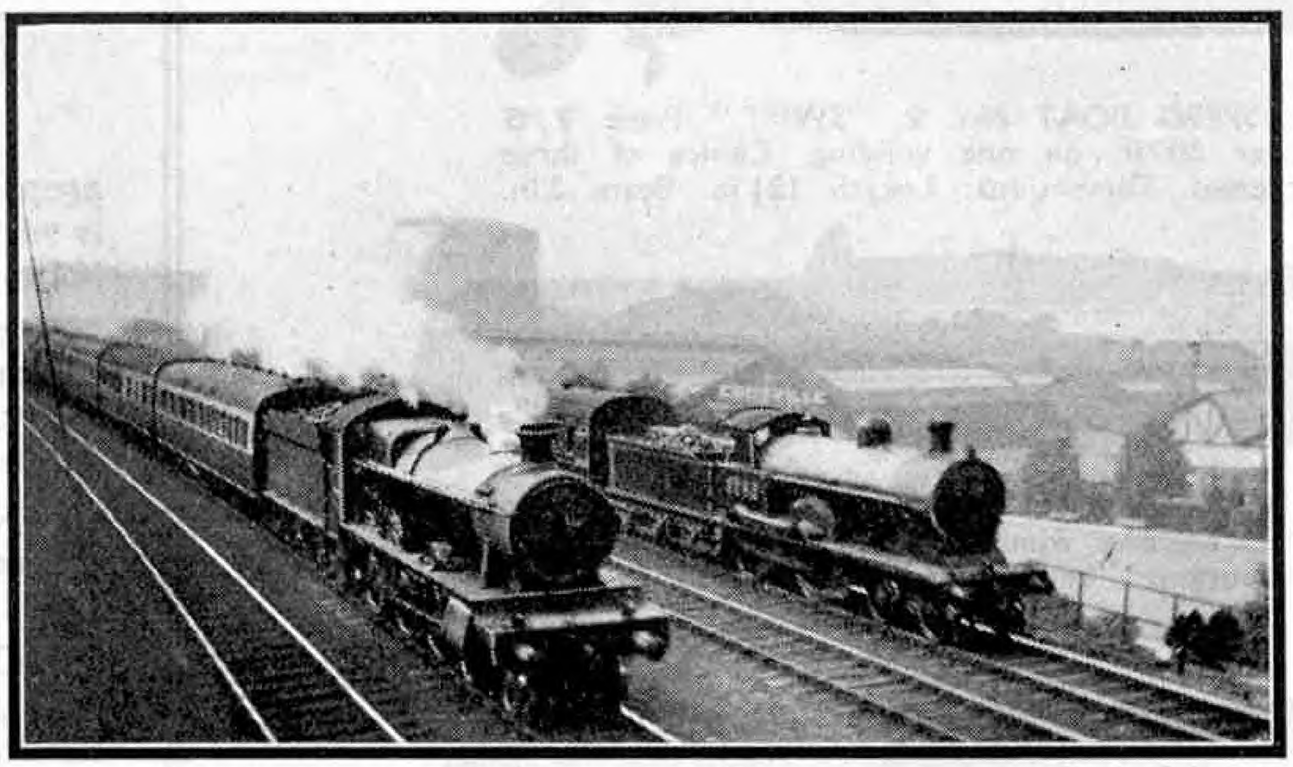
With the replacement of obsolete types by new and more efficient motive power the double-heading of passenger trains was reduced by 20 per cent. for the twelve months of 1935, and an increased mileage of 5 per cent. per engine was realised. In spite of the more intensive use of locomotive power and the increasing demands on the engines generally, the capacity of modern L.M.S.R. locomotive stock is such that coal consumption figures continue to fall.

At the same time the reorganisation and modernising of motive power depots is making it possible to operate and maintain the locomotives on a more efficient basis. One result of this is to eliminate many of the separate sheds formerly maintained by the separate constituent companies at centres served by several of them. For instance, at Carlisle the former Midland depot at Durran Hill was closed early in the year and the 30 locomotives stationed there are now allocated at Kingmoor (C.R.) and Upperby (L.N.W.R.).

A 70 ft. turntable is to be installed at London Road, Manchester, for turning locomotives of the 4-6-2 "Princess Royal" class.

L.M.S.R. Locomotive News

Locomotive No. 6145 of the "Royal Scot" class, formerly *"Condor,"* is now named *"The Duke of Wellington's Regiment (West Riding)."* The remaining locomotives of the class that have not so far been named after regiments are to be brought into line with the rest of the class in this respect. The new names are allocated as follows: No. 6128, *"The Lovat Scouts";* No. 6131, *"The Royal Warwickshire Regiment";* No. 6132, *"The King's Regiment (Liverpool)";* No. 6133, *"The Green Howards";* No. 6134, *"The Cheshire Regiment";* No. 6135, *"The East Lancashire Regiment";* No. 6136, *"The Border Regiment";* No. 6137, *"The Prince of Wales's Volunteers (South Lancashire)";* No. 6139, *"The Welch Regiment";* No. 6140, *"The King's Royal Rifle Corps";* No. 6141, *"The North Staffordshire Regiment";* No. 6142, *"The York and Lancaster Regiment";* No. 6146, *"The Rifle Brigade";* No. 6149, *"The Middlesex Regiment."* The names of historic locomotives previously borne by these engines are to be transferred to certain of the unnamed engines of the "Baby Scot" class.



The upper illustration shows the old Highland and Caledonian locomotives, preserved by the L.M.S.R. at St. Rollox, Glasgow, as repainted in their original colours. Photograph by courtesy of the L.M.S.R. The lower illustration, from a photograph taken by A. G. Hughes, Wallasey, shows G.W.R. and L.M.S.R. trains running alongside at Chester.

Two of the "5P5F" 4–6–0 mixed traffic locomotives Nos. 5157 and 5158 are to be named respectively *"Glasgow Highlander,"* and *"Glasgow Yeomanry."*

Among the locomotives recently withdrawn for scrapping are several of the 4–6–2 tanks of the former L.N.W.R. Many of the "George the Fifth" class have been withdrawn, including the pioneer engine No. 5320. This was built in 1910, so that its period of service has almost coincided with the reign of His late Majesty, after whom the engine was named.

"The Orcadian"

Yet another named train has been introduced by the L.M.S.R. Commencing this month, the Thurso portion of the 6.30 p.m. from Inverness and the corresponding portion leaving Thurso at 3.40 p.m. will be named *"The Orcadian."*

Doncaster Station to be Rebuilt

The L.N.E.R. announce that Doncaster station, which is a very important junction and traffic exchange point is to be rebuilt. Additional up and down main lines are to be provided between the north end of the station and Marshgate Junction, where the West Riding and Hull lines leave the main line of the East Coast Route. This will eliminate the "bottle-neck" character of the present layout between these points, where at present only two main lines are available to carry the whole of the traffic to and from the North. An additional up line will be laid through the station, the present up platform being converted into an island. The down platform is to be lengthened to accommodate the longest trains calling at Doncaster. Colour-light signals are to be installed in the station area.

The new arrangements will allow of the simultaneous departure of trains for York or Hull, and Leeds. Similarly arrivals from York, Hull or Leeds will be possible at the same time.

Accelerated Anglo-Scottish Services

From Monday, 4th May, the principal Anglo-Scottish services by both West and East Coast Routes will be accelerated. The greatest individual acceleration will be that of the L.M.S.R. *"Midday Scot,"* which will leave Euston at 2.0 p.m. instead of 1.30 p.m., thus reverting to the departure time familiar for many years for this service until War-time decelerations caused its abandonment. Glasgow and Edinburgh will be reached, as now, at 9.35 p.m. and 9.55 p.m. respectively.

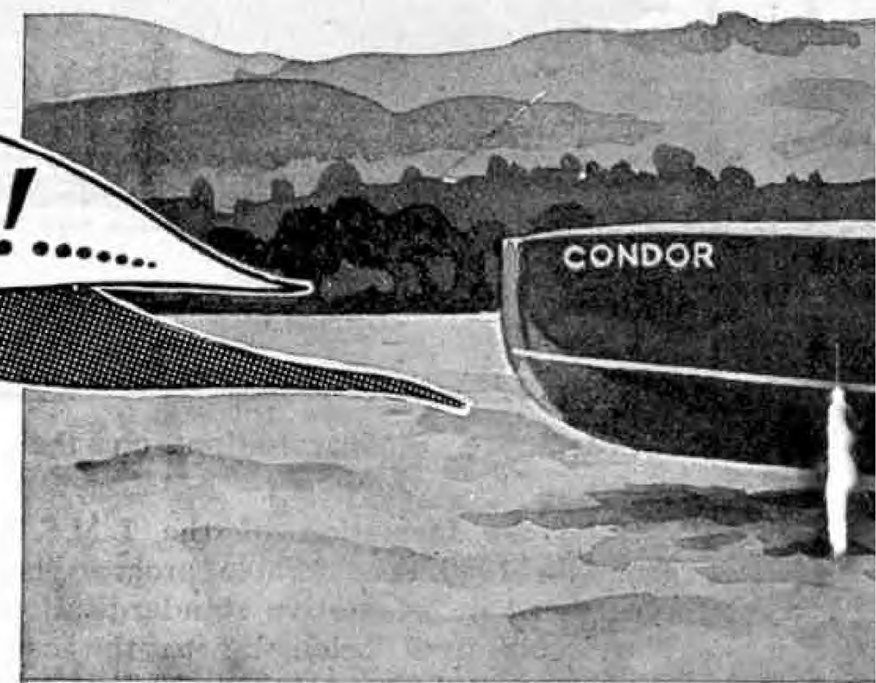
The service now provided to the Furness line and the Lake District by *"The Midday Scot"* will be afforded by a separate new train leaving Euston at 1.30 p.m. and giving earlier arrivals than at present. *"The Royal Scot"* is to reach Glasgow and Edinburgh 10 min. earlier, and its rival *"The Flying Scotsman"* will be 5 min. faster than now to Edinburgh and Aberdeen. The *"Queen of Scots Pullman"* will be accelerated by 10 min. in each direction.

The 11 a.m. on week-days, and the 4 p.m. on Sundays, from Inverness to King's Cross will each be 5 min. faster and various additional services are to be provided.

PRODUCT of MECCANO LIMITED LIVERPOOL

HORNBY

AHOY THERE, BOYS!.....



This is H



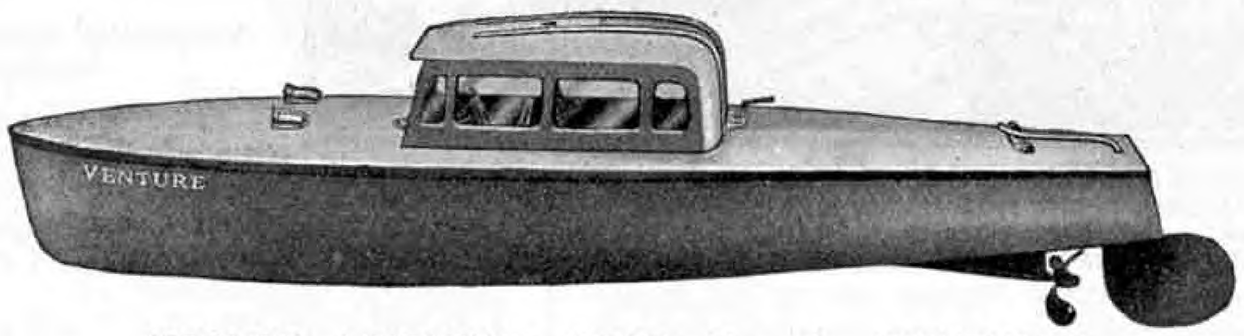
HORNBY SPEED BOAT No. 1. "HAWK." Price **2/11**
Travels over 100 ft. on one winding. Choice of three colour schemes. Dimensions: Length 9¼ in. Beam 3 in.



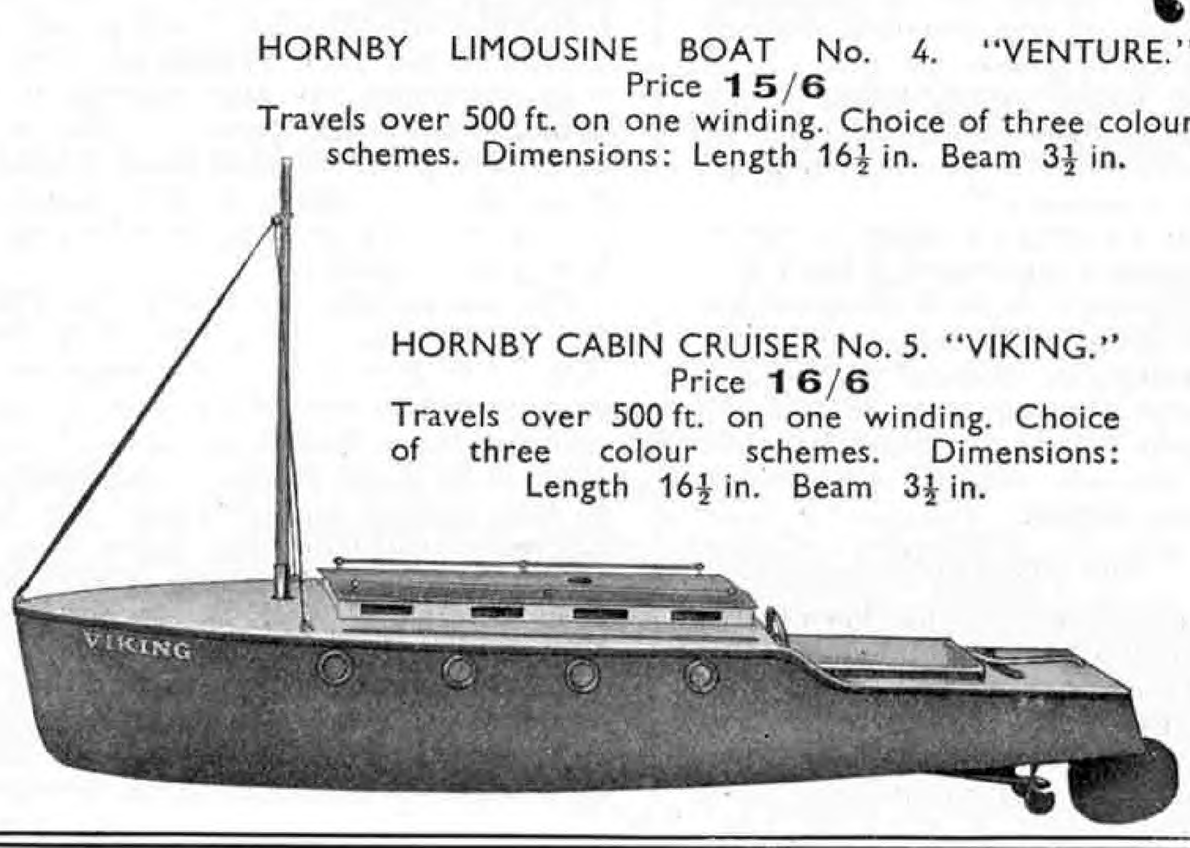
HORNBY SPEED BOAT No. 2. "SWIFT." Price **7/6**
Travels over 300 ft. on one winding. Choice of three colour schemes. Dimensions: Length 12½ in. Beam 3 in.



HORNBY SPEED BOAT No. 3. "CONDOR." Price **12/6**
Travels over 500 ft. on one winding. Choice of three colour schemes
Dimensions: Length 16½ in. Beam 3½ in.



HORNBY LIMOUSINE BOAT No. 4. "VENTURE."
Price **15/6**
Travels over 500 ft. on one winding. Choice of three colour schemes. Dimensions: Length 16½ in. Beam 3½ in.



HORNBY CABIN CRUISER No. 5. "VIKING."
Price **16/6**
Travels over 500 ft. on one winding. Choice of three colour schemes. Dimensions: Length 16½ in. Beam 3½ in.

Enjoy the Thrills o

One of the few outdoor hobbies that preparation, either alone or with friends is within the reach of almost every boy, fo hobbies, and it provides hours of fun and

Hornby Speed Boats and Racing Boat performance, graceful lines and beautiful fi splendid boats. They introduce a new stan will be proud to possess one of them.

Nothing like the Hornby Speed Boa before in model boat construction.

HORNBY SPEED BOATS

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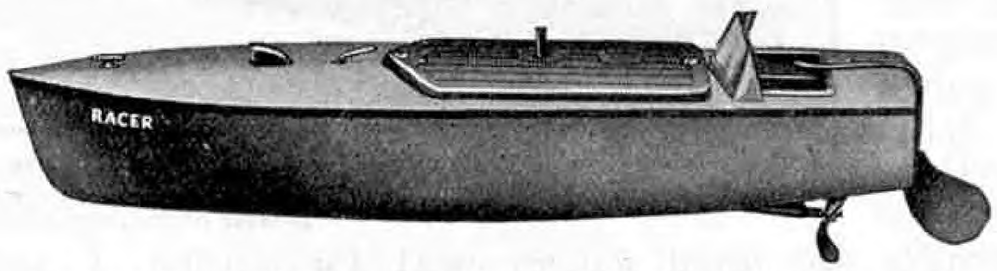
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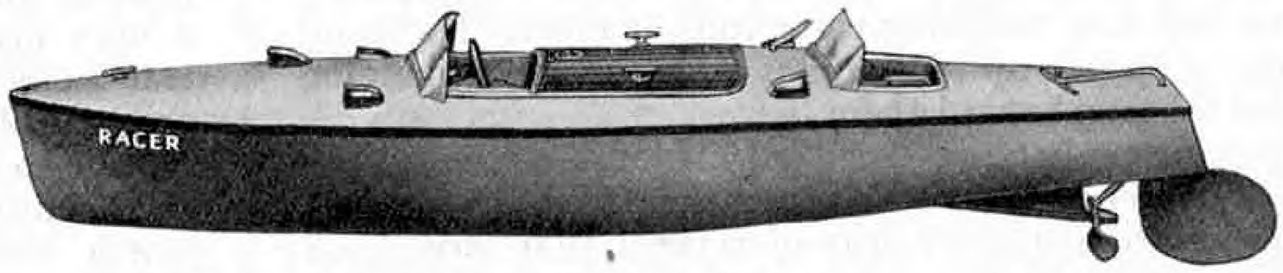
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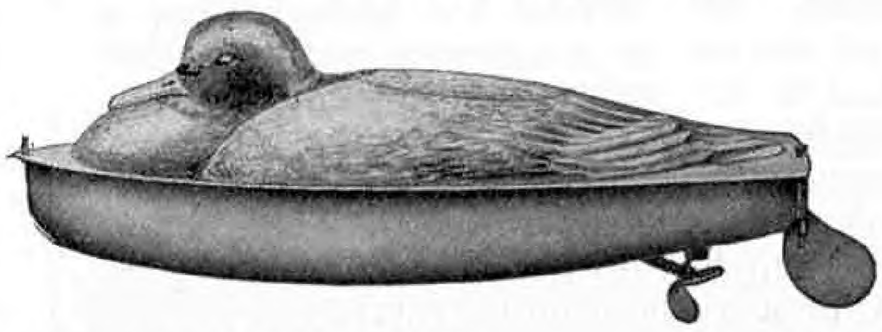
HORNBY RACING BOAT No. 1. "RACER I." Price **4/6**
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Miniature Railways That Carry Real Passengers

Garden Systems at Home and Overseas

By W. J. Bassett-Lowke, M.I.Loco.E.

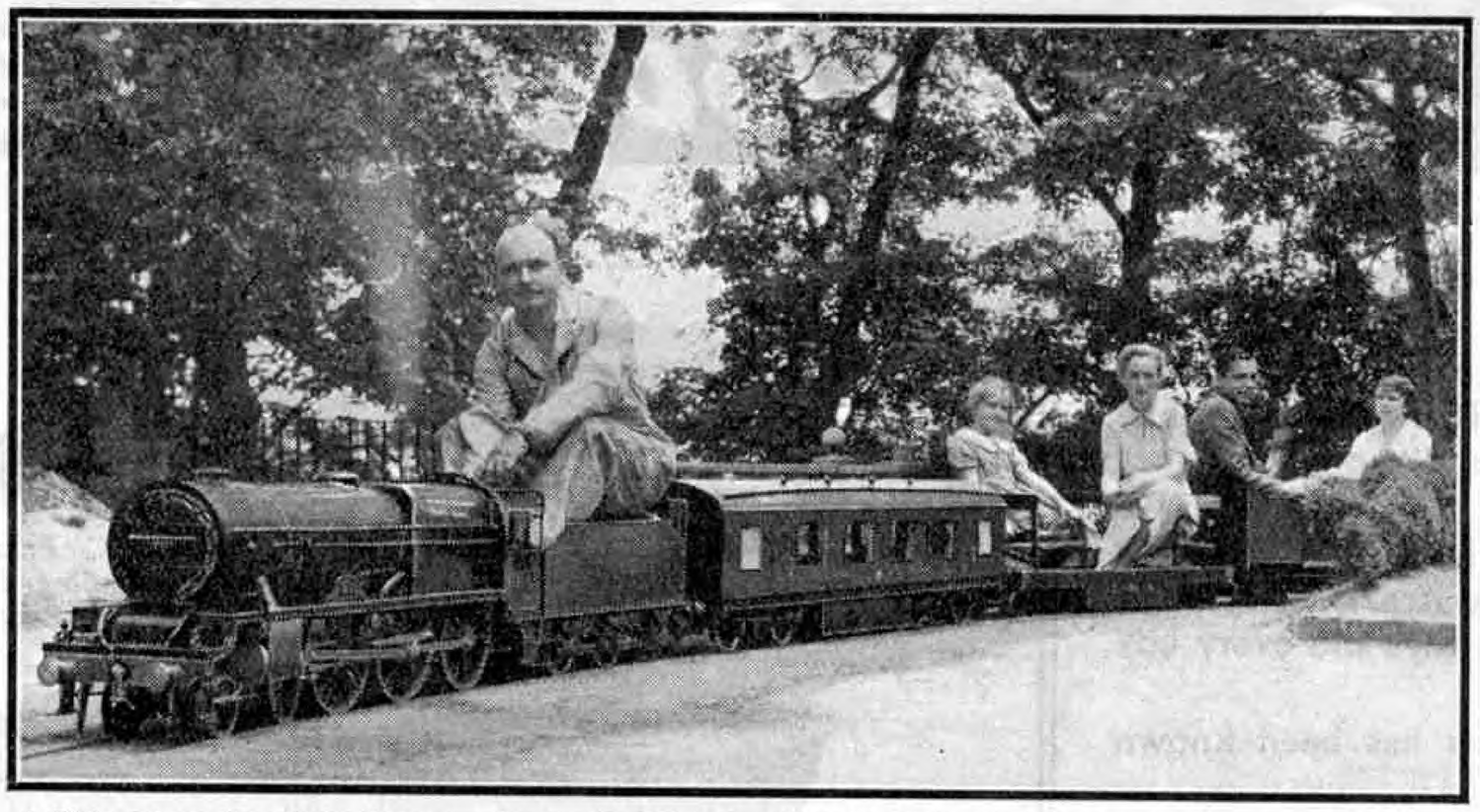
ONE of the greatest attractions of the miniature railway hobby is the wide variety of the interests that it includes. Layout design, train operation, scenic effects, signalling and so on are all branches of the main subject that can be given special attention individually, or combined satisfactorily, on an indoor line. For such railways clockwork or electricity is invariably the motive power. Outdoor railways, that is lines designed and constructed to be permanent and to withstand the weather, have a special appeal and on such systems a steam-driven locomotive gives the utmost realism. The outdoor line is specially attractive in that real cuttings and embankments can be formed, and such engineering features as tunnels and bridges may be really necessary and not provided only for effect.

The thrill of a steam-driven locomotive only reaches its height when the model sets out to pull its owner, and this is now possible with engines running on so small a gauge as 2½ in. It is easier on the 3½ in. gauge, and as we progress through the usual gauges used for garden railways essentially designed for passenger carrying, 7¼ in. and 9½ in., to 15 in. gauge, we arrive at locomotives that are far from toys. They are powerful engines one-quarter full size, weighing three tons or more. These are capable of speeds up to 35 miles an hour, and of hauling loads of 20 tons behind them.

The gauges that are most popular and useful to the private model railway owner are the 7¼ in. and 9½ in., and it is interesting to hear of several that have been recently constructed, two on estates in England, one in the United States and one in India. The first of these is owned by Mr. J. R. Jeffress of Kenton Grange, near Harrow, Middlesex. Mr. Jeffress has always been a railway enthusiast and has one of the most comprehensive and complete gauge "O" railways in the country, but lately he has taken up the hobby of garden railways. Like many persons with leisure and a mechanical bent, he has not only designed and supervised the construction of his own layout, but he also builds most of his 7¼ in. gauge models in the workshops on his estate.

His first locomotive is an L.M.S.R. *"George the Fifth"* locomotive built from early designs of Mr. Henry Greenly from castings supplied by Bassett-Lowke Ltd., of Northampton. This engine has a simple handsome outline, and the use of inside cylinders means that there is no outside gear to foul obstructions in the garden. In addition the comparatively short wheelbase of the locomotive allows it to negotiate sharp curves. There is also a 4–6–2 type locomotive of American design built in his own workshop, and a 4–6–0 L.N.E.R. locomotive. This last engine was originally built by Bassett-Lowke Ltd. in pre-War days as G.C.R. No. 1097 *"Immingham,"* and it still does good work at Kenton Grange.

A model of the L.N.E.R. express locomotive No. 4472 *"Flying Scotsman"* that was built in Mr. Jeffress' own workshop has recently been put into service; and the latest addition that is now nearing completion will be a model of the L.M.S.R. *"Royal Scot."* The track on this railway is continuous and possesses two stations. There are tunnels and sheds, and the rolling stock consists of bogie open wagons and one covered vehicle.



A 7¼ in. gauge "Royal Scot" locomotive on the "Charnwood Model Railway" in Pennsylvania operated by Mr. C. Norvin Rinek. The photographs to this article are reproduced by courtesy of Bassett-Lowke Ltd., Northampton, the makers of the engines illustrated.

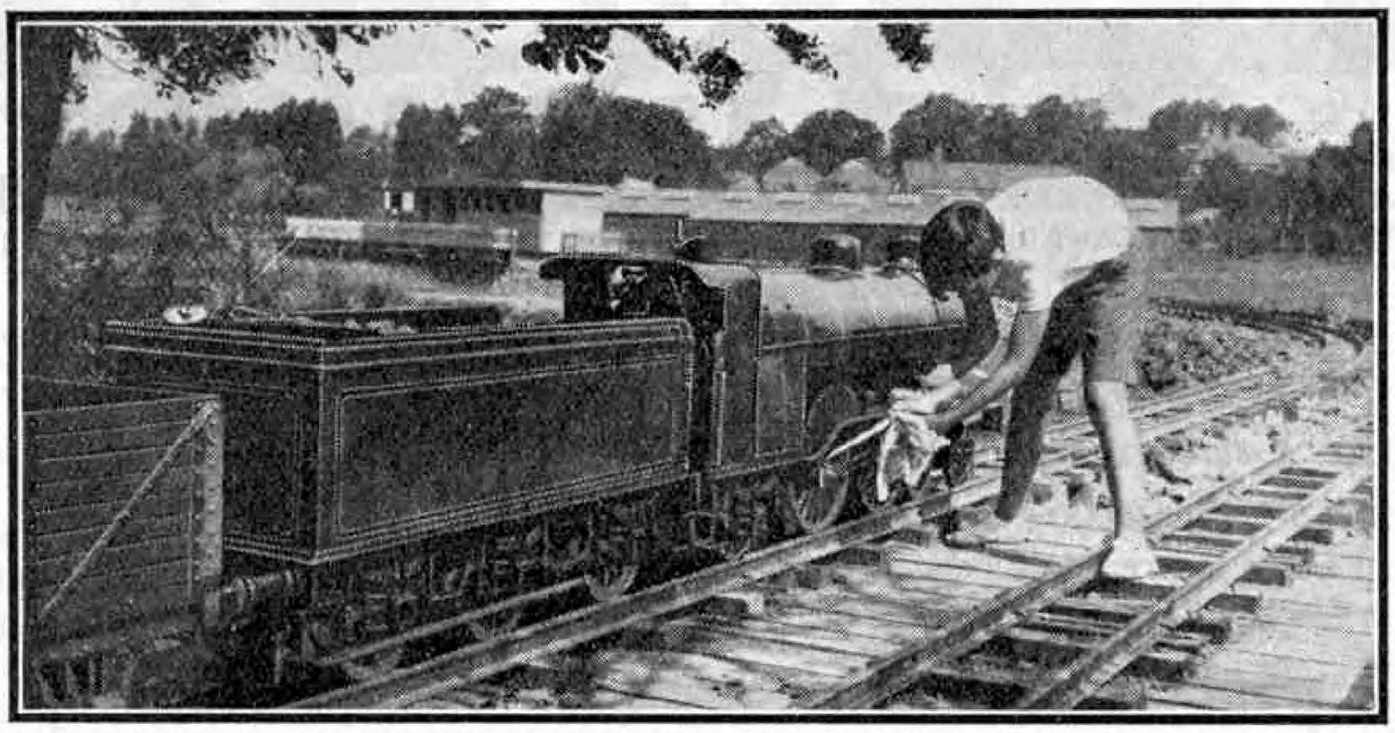
Going north, we come to Harness Grove near Worksop, the residence of Captain C. F. Ward Jones, where a splendid 9½ in. gauge railway is now being constructed by the owner for his son. When visiting this line the first railway building we approach is the engine shed. This is a very practical and modern building, from which the track emerges at a level of about four feet from the ground. The raising of the rail level enables the locomotive to be cleaned and attended to conveniently. The shed contains an electric blower for raising steam, and a bench with all necessary tools for the handling and maintenance of the locomotive. Oil containers are handy for drawing supplies and there are various other stores. Outside the shed is a bridge with two arches carried out in synthetic brickwork. The water tower nearby is mounted on four concrete pillars.

The line was laid by the owner, to a gauge of 9½ in., with flat-bottomed Vignoles rail, and is already half a mile long. From the shed it traverses an embankment and soon reaches the main railway station. This is a building of excellent design and inside is arranged an ingenious little refreshment room provided with tables, where one can obtain chocolates and refreshments.

Leaving the station the line crosses a small brook by an underbridge. It then traverses a picturesque woodland

coppice for about 400 yds., passing a wayside station there, and returning by a loop to the main line again. There are two crossover roads, one at each end of the station. The radius of the curves is 80 ft.

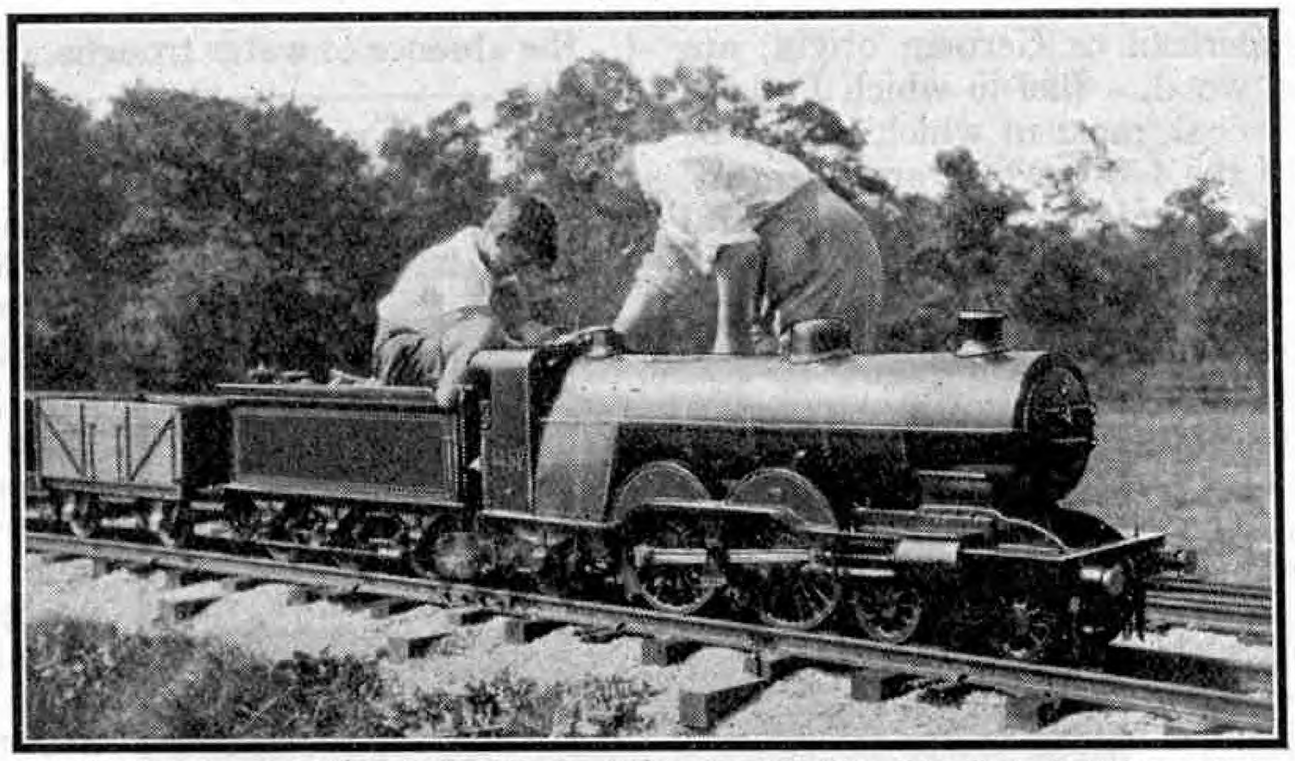
The locomotive is an L.N.E.R. 4–4–2 "Atlantic" of G.N. design built by Bassett-Lowke Ltd. It has cylinders with a diameter of $2\frac{3}{4}$ in. and a piston stroke of 4 in., and the bronze valves are operated by Stephenson link motion. The boiler is fitted with copper tubes and has a correct Wootten firebox with a wide grate. The cab fittings include two injectors, pressure gauge, two water gauges, blower, whistle, and forced lubrication system. The locomotive is fitted with the steam brake and there are hand brakes on the tender. The owner has built his own rolling stock, which consists of several very realistic open wagons. These are very comfortable to ride in.



"Oiling up." The youthful engine driver in this photograph is busily attending to the 9½ in. gauge L.N.E.R. 4-4-2 on the railway of Captain C. F. Ward Jones at Harness Grove, nr. Worksop.

Next there is the "Charnwood Model Railway" laid out by an American enthusiast in Pennsylvania. The line is laid out in circular form 800 ft. in circumference, with a spur to the engine shed. The curves are rather sharp, of 35 ft. radius and 40 ft. radius, and at one point the grade rises at 1 in 30.

The first locomotive made for this track was a *"King George V"* by Bassett-Lowke Ltd. As readers know, Canadians and Americans were greatly interested in the visit of *"The Royal Scot"* train to America. They went in their tens of thousands to view the "little English train" at the Century of Progress Exhibition at Chicago in 1933, and on the American tour of the train they crowded and flocked to the stations and level crossings to catch a glimpse of it. Among these admirers of *"The Royal Scot"* was Mr. C. Norvin Rinek, already a model enthusiast, and he so liked the lines of the English engine that he could not rest until he had an exact working scale model for his $7\frac{1}{4}$ in. gauge garden railway.



Another view of the L.N.E.R. 4-4-2 with the driver on board. This photograph shows the realistic lines of the engine and the substantial character of the permanent way.

So the second engine on this system is the L.M.S.R. 4–6–0 No. 6100 *"Royal Scot,"* again made by Bassett-Lowke Ltd. It incorporates a number of features to make it possible for an engine of this size to negotiate the 35 ft. radius curve. The engine is fitted with a mechanically-driven oiler, dumping grate, automatic pet cocks and snifting valves. It will negotiate the curves at almost full throttle. The Charnwood Model Railway is entirely English in character, and it is interesting to know that English engines, even if in miniature, are running in America to day.

Another overseas line on which a British type engine is operated is the "Indian Midland Railway" at Jhansi, that was described in the July 1935 *"M.M."* This system is owned and was laid out by Mr. R. Horsfield, E.D., A. M. I. Mech. E., M.I.Loco.E., of the Great Indian Peninsular Railway. As might be expected, all the work is carried out with great thoroughness, even to the provision of interlocking and special signal and telephone instruments for train working between the two main stations. At the terminus is a ground frame signal cabin, a booking office with platform and journey tickets; and even train destination and timetable boards are provided.

The practice of this line is an interesting combination of British and Indian features. Thus the engine is a close reproduction of the 4–4–0 Standard Compound class of the L.M.S.R., the actual prototype belonging to the "1100" series so well known on L.M.S.R. main lines. This was constructed by Bassett-Lowke Ltd., at Northampton, and works at a pressure of 100lb. per sq. in. It is complete with steam-brakes, an injector working between pressures of 40 and 95 lb. and a feed pump. Steam and water gauges are of course provided. A boiler blow-down cock and cylinder drain cocks are fitted. The cylinders are lubricated by a hand-forced system. Oil cups for slide bars, bogie and leading coupled wheel boxes are employed, while a forced feed attends to the valves and trailing coupled wheel boxes.

The rolling stock includes four-wheeled wagons with L.M.S.R., G.W.R., and L.N.E.R. lettering. These are fitted with buffers, and screw couplings. The goods brake van, however, conforms to Indian Railway standard design and is similarly equipped.

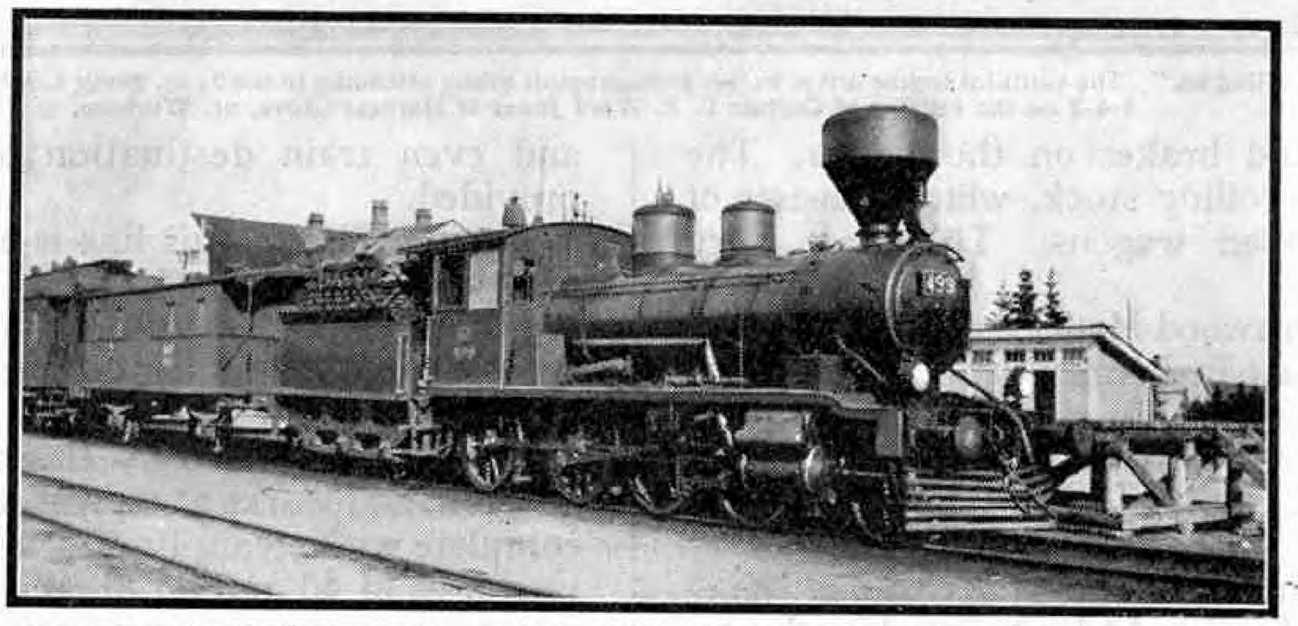
The locomotive shed is equipped with an examining pit, and is complete with a repair bench, vice, the necessary tools, and an oil and waste store. Immediately outside the shed, which conforms to the "round house" type, there is a turntable serving the various tracks radiating from it. One track for a length of 9 feet is raised up from the ground. It thus allows for storm water flow and also forms an outdoor inspection "pit" for the purpose of cleaning the fire and for the very necessary examinations of the locomotive. Steam invariably is raised while the engine is on the pit.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Scenes on the Finnish Railways

There are now in Finland nearly 3,000 miles of railway, mostly state-owned, and a line has recently been extended northward to the Arctic Circle. The track, which is of 5 ft. gauge, is single throughout most of the north of Finland, and is laid down without chairs. At most of the local stations there are passing loops and the points are frequently hand-operated. Except near the bigger junctions, the system of signalling is not elaborate. Distant signals are not employed to any great extent on the local lines, but each station has its home semaphore.



A wood-burning 4-6-0 locomotive in Finland. The wide-topped funnel arrests sparks that might cause forest fires. Photograph by E. G. Lock, Kingston Hill, Surrey.

The locomotives, many of which are of American or German origin, are painted black. Some burn wood, a fuel in which Finland abounds; and others burn coal, most of which has to be imported. Locomotives of the 4–6–0 wheel arrangement, with driving wheels 5 ft. in diameter, are the most general type, and are used all over the country for mixed traffic. A wood-burner is shown in the accompanying photograph. The wide-topped funnel acts as a spark catcher to prevent the possibility of forest fires. This is a necessary precaution, since most of the Finnish lines run through forested country. In the south, coal-burning 4–6–0s with 6 ft. driving wheels are usually employed on the passenger trains, and large tank engines are used for some of the suburban traffic around Helsingfors.

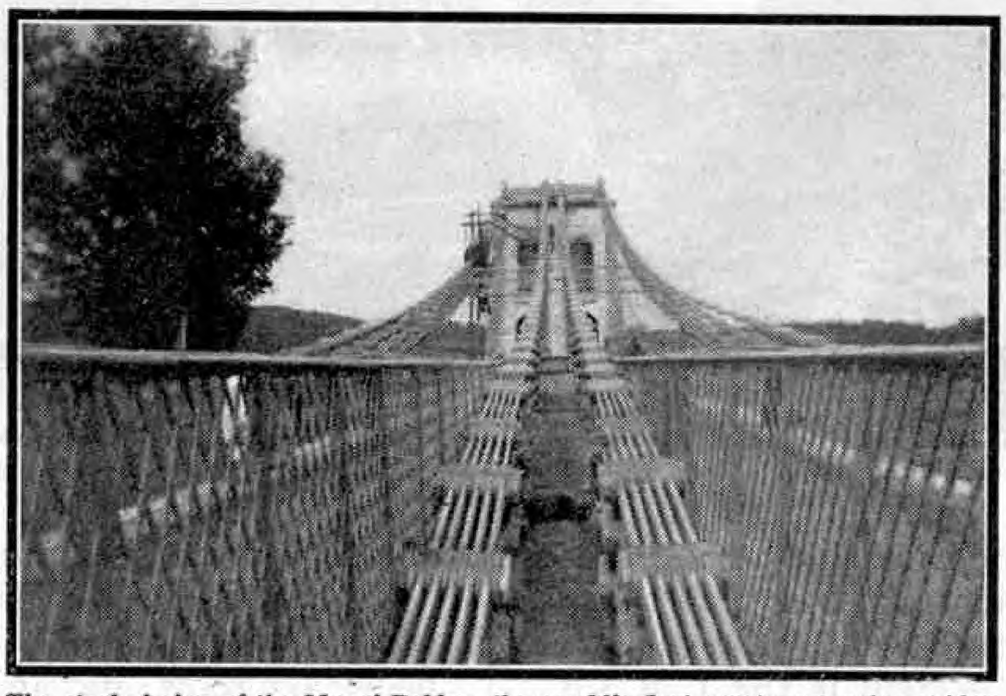
The passenger rolling stock varies a good deal. The 1st-class coaches, sleepers and dining cars have eight wheels and are comfortably upholstered, but many of the 3rd-class coaches are old four-wheelers, and their plain wooden seats are somewhat hard for long journeys. The passenger stock is painted plum colour and bears the word "Suomi" on the sides, Suomi being the national name of the country we call Finland.

Freight trains are not very numerous, for many local trains run with mixed passenger and goods stock. In the vicinity of the ports goods trains play a more important part, however, especially in the great Finnish timber trade.

Expresses, on which a small extra charge is made, and fast and local or slow trains are run. The slow trains stop at all stations, but the halts are of very short duration, except those made to allow passengers to get refreshments. The best trains, hauled by coal-burning 4–6–0s, run between Helsingfors, the capital, and the seaport towns of Åbo and Vipuri, and on these routes the overall times average between 45 m.p.h. and 50 m.p.h. Long non-stop runs are not possible owing to the small tenders used and the absence of water troughs. E. G. Lock (Kingston Hill).

Painting the Menai Bridge

The lower photograph on this page shows the immense steel chains that support the Menai Bridge, the graceful structure that connects the mainland of Wales with Anglesey. It was taken at a point where the chains enter the ground at the Anglesey end, and shows the scaffolding erected for painting purposes. The tiny figure of a workman busily painting can be distinguished between the chains in the centre near the top of the tower. It was interesting to watch the men at work on the bridge, for they were slung over the side of the structure in travelling cradles. I was told that a silica-graphite paint is now used because it is thought to stand up to weather conditions more satisfactorily than the lead paints previously employed.



The steel chains of the Menai Bridge, the world's first great suspension bridge. Photograph by G. W. R. Heller, Gerrard's Cross.

The bridge is one of the most famous of the works of Thomas Telford, the great engineer who was punningly named the "*Colossus of Roads*" by his friend the poet Southey, because of his extensive road-building activities.

G. W. R. Heller (Gerrard's Cross).

A Uganda Chieftain at Home

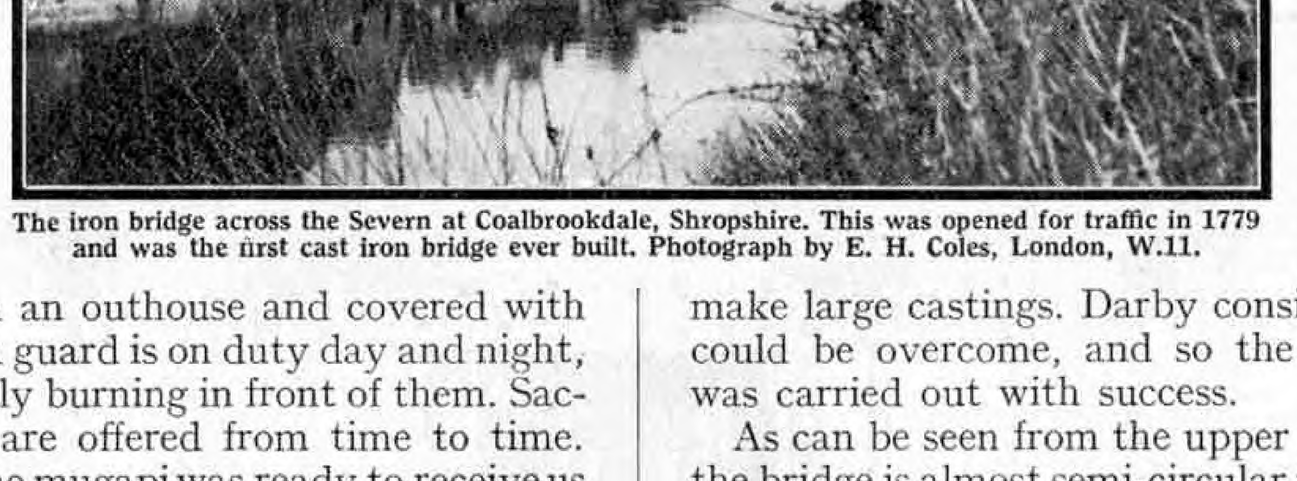
While travelling recently through Uganda, I was asked by a friend if I would like to visit the native king of the district and I eagerly accepted his offer. Uganda is governed by a system of indirect rule, the native chiefs maintaining their own systems of administration under supervision by the British officials. This particular king or "mugapi," as he is called, has been on the throne since 1901, when Uganda first became a British Protectorate.

A note was sent to the palace, which was a medium-sized stone house of rather tumble-down appearance, to say that two "wazungu" would like an audience. While we awaited the reply we were shown the royal drums, which vie in importance with the king himself. They are only beaten on special occasions, and are kept in an outhouse and covered with rugs to keep them warm! A guard is on duty day and night, and a fire is kept continually burning in front of them. Sacrifices of milk and meat are offered from time to time.

We were now told that the mugapi was ready to receive us and were ushered into a small room furnished in a dingy Victorian style, with decorations that evidently had been brought from England on the king's accession in 1901. The mugapi was sitting in an upright armchair at one end of the room with a soap-box as a footstool! Above his head were framed photographs of King George and Queen Mary, and above them again was a white card with "Welcome" printed on it. Like the majority of his race, the chieftain was finely built. He must have stood well over seven feet high and was broad in proportion. He was simply clothed in a kanzu, the ordinary native dress, which is a sort of nightshirt reaching to the ground.

We sat in chairs facing the throne and conducted our conversation by means of interpreters, although the mugapi seemed to understand a good deal of what we said in English. We found him rather difficult to talk to, for his knowledge of the outside world was limited. We discussed the five cars that he possesses, and he told us something of the customs and laws of his people, and their contentment under British rule. While we were talking his orchestra formed up outside and began to play weird native music that seemed to please him. We rose and took our leave after shaking hands with the mugapi and exchanging small gifts with him; and so ended one of the most interesting experiences of my life in East Africa.

B. A. Soltau (Kenya).



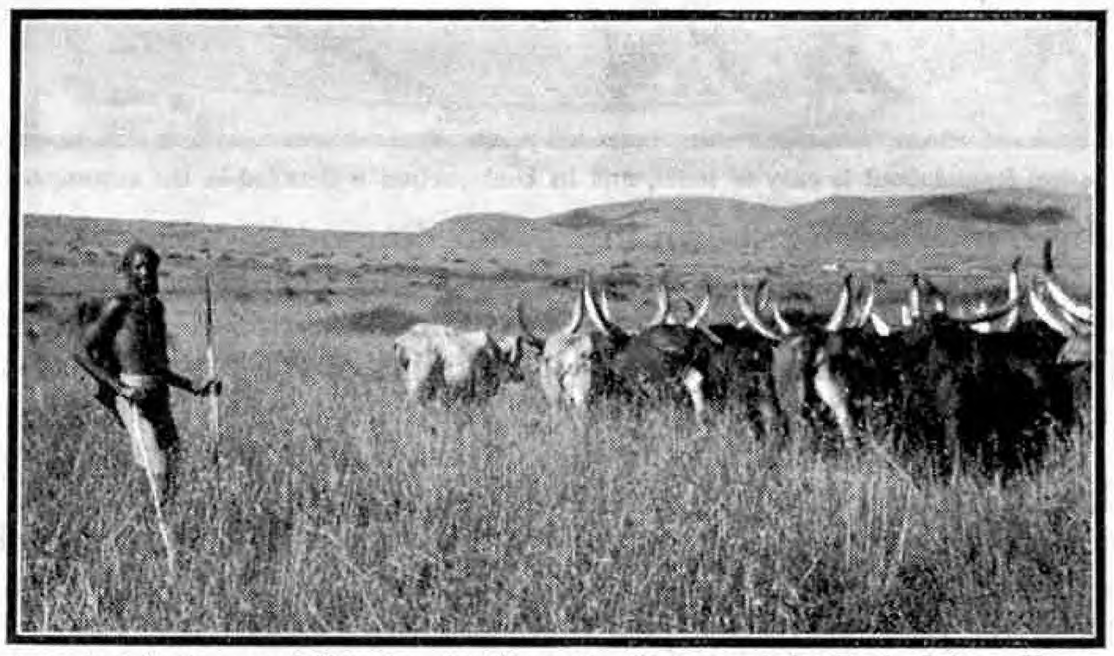
The iron bridge across the Severn at Coalbrookdale, Shropshire. This was opened for traffic in 1779 and was the first cast iron bridge ever built. Photograph by E. H. Coles, London, W.11.

The World's First Iron Bridge

England can claim to have the first iron bridge ever built. This crosses the Severn at Coalbrookdale. It was opened for traffic in 1779, and is yet in active service.

A little more than 150 years ago the Severn was a severe handicap to the growing iron and pottery trades of Shropshire, and the ferry then in use at Coalbrookdale had become inadequate. Mr. Abraham Darby, the owner of a large iron foundry there, proposed that a bridge should be built and suggested that it should be constructed of cast iron. This was a revolutionary idea, for all bridges constructed up to that time had been of either stone or timber. Attempts at cast iron bridge construction had indeed been made in France some 20 years earlier, but had failed owing to the inability to make large castings. Darby considered that this difficulty could be overcome, and so the project was begun and was carried out with success.

As can be seen from the upper photograph on this page, the bridge is almost semi-circular in outline. It has a span of 100 ft. and rises 45 ft. above abutments. The five ribs of the structure, each 140 ft. in length, were cast in two pieces. This was an amazing achievement in view of the lack of experience at that time of work of this description, and its accomplishment adds to the interest of this pioneer structure. E. H. Coles (London, W.11).



A typical herdsman of Uganda with his cattle. Photograph by B. A. Soltau, Kenya.

Thrills on the Eiffel Tower

On the day that my French friend and I went up the Eiffel Tower, there was a terrific gale blowing, with driving sleet and fog, and on glancing upward from the foot of the structure, we discovered that the top was completely hidden in mist. The liftman told us that we were the only visitors that morning. He was rather dubious about letting us go up, but we managed to persuade him to take us.

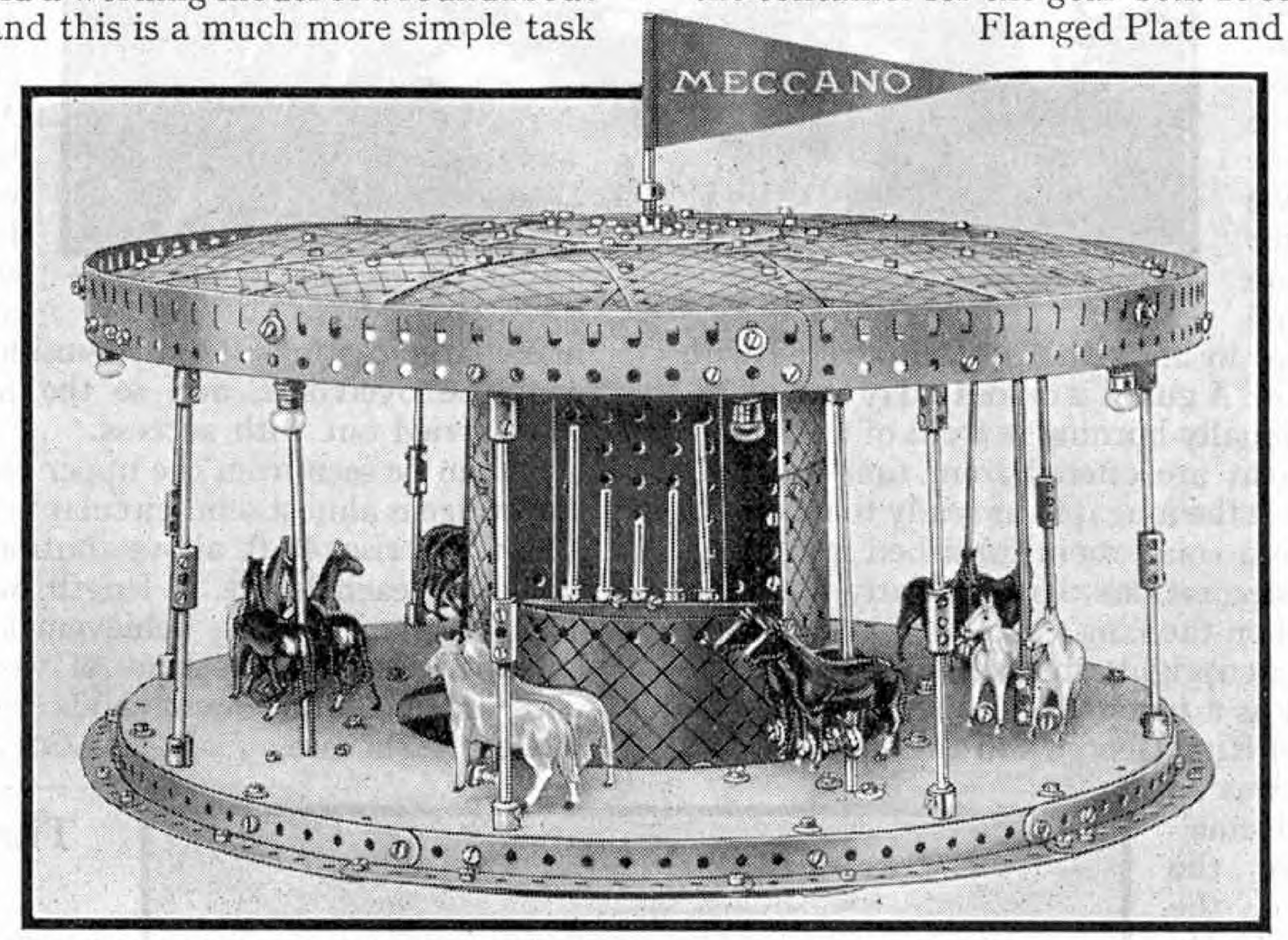
As the lift went higher the wind grew stronger, and when we stepped out on to the balcony, my first thought was that the top part of the Tower was going to snap off suddenly, for it was actually swaying from side to side. The wind threatened to blow us off the platform, and the rain lashed blindingly in our faces. I held fast on to the rail and shut my eyes, which were smarting and running with water, and then it seemed as though I were on the bridge of a Channel steamer in a storm! When I opened my eyes, I could see nothing for the mist and fog that enveloped us, and soon stumbled back into the lift. C. Lewis (Stoke-on-Trent).

A Fascinating Fun Fair Model

Roundabout with Dinky Toy Horses

ALTHOUGH many modern sources of amusement and entertainment are now available, the old-fashioned fun fair has not been pushed completely into the background, as the popularity of pleasure grounds at popular seaside resorts shows. Almost everyone has experienced the fascination and thrill of joy riding on the roundabouts that are such prominent features of fun fairs, and among these the hobby-horses are still favourites, in spite of competition from similar devices equipped with motor cars or flying boats.

It is good fun to build a working model of a roundabout with Meccano parts, and this is a much more simple task than at first appears. A typical example is the model illustrated on this page. This is made entirely from Meccano parts, with the addition of Dinky Toy Horses; it incorporates neat and interesting mechanisms, is easy to build, and will provide great amusement for its constructors.



This fine model Roundabout is easy to build, and its construction is detailed in the accompanying article.

The base of the model is a Geared Roller Race, but model-builders who do not possess this part can substitute a frame of Angle Girders, or a base made of Flat Plates. Four $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are first of all secured in place, as shown in the lower illustration on the opposite page, two washers being used on each holding-down bolt to raise them slightly above the base. Each Double Angle Strip carries a $4\frac{1}{2}''$ Rod, at one end of which is a $\frac{1}{2}''$ Pinion and at the other a $\frac{1}{2}''$ fast Pulley. The Pinion is spaced from the Double Angle Strip by a washer and the Pulley by two washers. A Bush Wheel with its boss uppermost is bolted in the centre of the base. Two pairs of $2\frac{1}{2}''$ Angle Girders are bolted to the base so that they are parallel to one pair of diametrically opposed Double Angle Strips. These form supports for $3'' \times 1\frac{1}{2}''$ Flat Plates on which the Electric Motor is mounted, as shown in the detailed illustration of this section of the model.

A $2\frac{1}{2}''$ Rod journalled in the lower centre hole of the Motor side plates carries on the outside a 50-teeth Gear Wheel, which is spaced from the Motor side plate by a Collar, and on the same Rod, but between the side plates, are a $\frac{3}{4}''$ Pinion, a Coupling and a Collar. A $1\frac{1}{2}''$ Rod is journalled in the Bush Wheel already mentioned and in the longitudinal bore of the Coupling, and carries two $1\frac{1}{2}''$ Contrates 1 and 2. The Contrate 1 is in mesh with the $\frac{3}{4}''$ Pinion on Rod 15, and Contrate 2 makes contact with the four $\frac{1}{2}''$ Pinions mounted on the base plate. The drive is taken from the 50-teeth Gear Wheel on Rod 15 to 12 by means of a $\frac{3}{4}''$ Pinion. On Rod 12 there is also a 57-teeth Gear Wheel, and this engages a $\frac{1}{2}''$ Pinion on Rod 14, which carries also a second 57-teeth Gear Wheel. A $\frac{3}{4}''$ Pinion on the Armature Shaft of the Motor drives this Gear Wheel by means of a 50-teeth Gear Wheel and a $\frac{1}{2}''$ Pinion on Rod 13. Clearance for the various Gears and Pinions is given by washers and Collars.

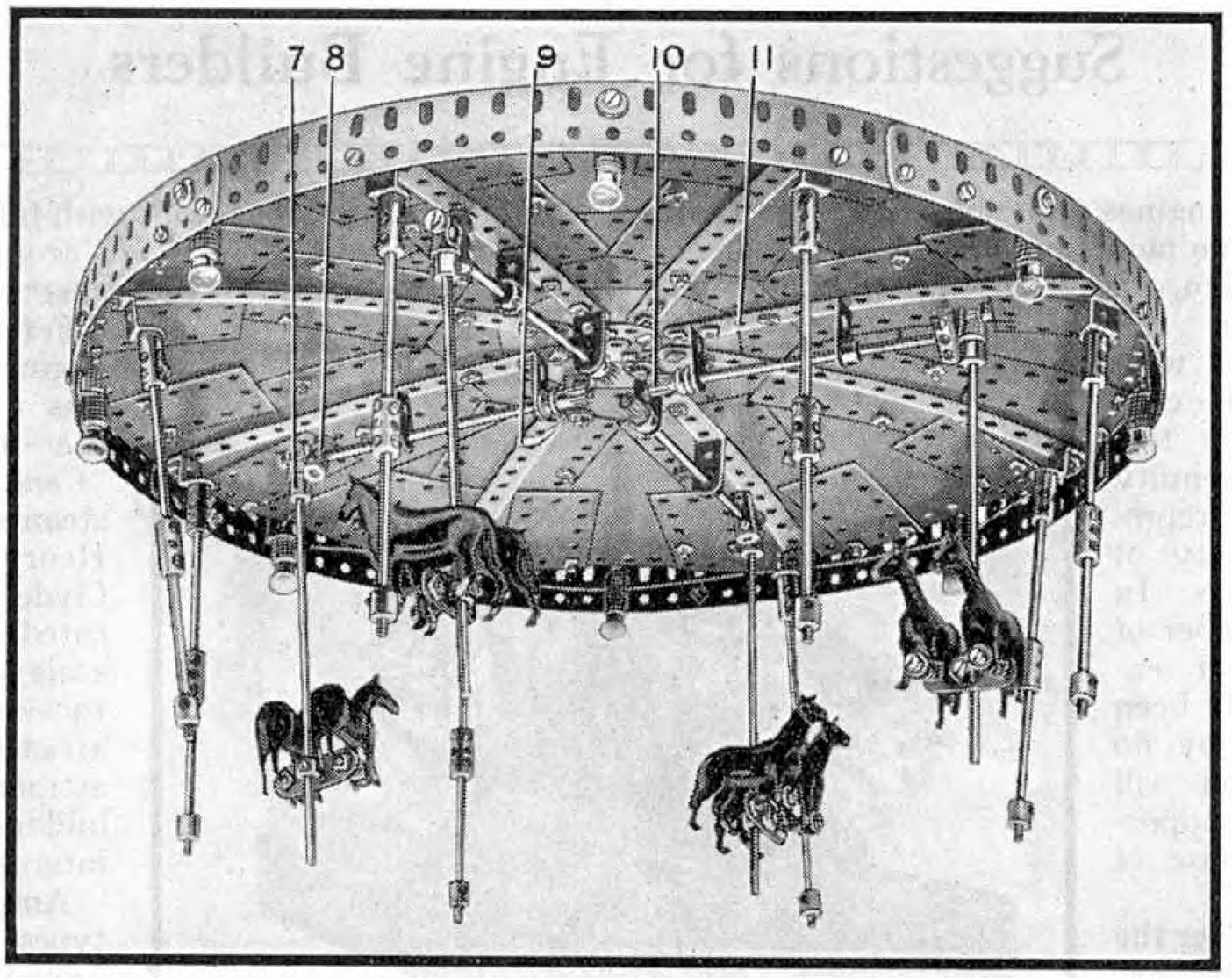
The imitation organ in the centre of the machine forms the container for the gear-box. It consists of one $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and four $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to the flanges of an E6 Electric Motor, the Flexible Plates being strengthened by means of $3\frac{1}{2}''$ Strips. The organ pipes are two 3", two 2" and one $1\frac{1}{2}''$ Rod. These are pushed through the lower flange of the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and held in position by means of Collars.

The driving mechanism is enclosed in a cylinder made by bolting $9\frac{1}{2}'' \times 2\frac{1}{2}''$ and $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates to the rims of a Circular Girder and a Hub Disc, a space $4\frac{1}{2}''$ wide being left to accommodate the organ. The Hub Disc is used at the top and in its centre is placed boss downward, a $1\frac{1}{2}''$ Contrate, which is spaced from the Hub Disc by Collars on the shanks of the four $\frac{1}{2}''$ securing bolts. A 5" Rod is secured in the boss of the Contrate, and around it is placed a $3\frac{1}{2}''$ Gear Ring that is held in position by four 6BA Screws and is insulated from the Hub Disc by Insulating Bushes and Washers. Four Flat Brackets are bolted to the bottom of the cylinder, and bolts pushed through these are screwed into the Threaded Bosses 4.

For the base of the rotating structure a ring of tin-plate or cardboard having an external diameter of $15\frac{3}{4}''$ and an internal diameter of $7\frac{1}{2}''$ is used. Readers who constructed the model Roundabout described on page 105 of the February "*M.M.*" will be interested to know that the circular track of tin-plate or cardboard used in that model can be used equally well in the Hobby-Horse. A Ring Frame is bolted to the inner rim of the base, and twelve $\frac{1}{2}'' \times \frac{1}{2}''$ Reversed Angle Brackets are bolted at regular intervals around the outer rim. Eight Rod Sockets also are secured to the outer rim. Curved $12\frac{1}{2}''$ Strips are fixed to the centre holes of the Reversed Angle Brackets, either by bolting direct or, where the holes do not coincide, by

clamping with Flat Brackets; and a similar method is used to fix a Ring of 5½" Curved Strips to the free ends of the Reversed Angle Brackets, the object of this being to form a step around the base of the machine. When this part is completed it can be placed over the gear box so that the Ring Frame rests in the grooves of the four Pulleys 6.

The roof of the model is shown in detail in the upper illustration on this page. The centre is a 4" Circular Plate, to which are bolted eight 7½" Strips radially disposed and curved to the required shape, with a Bush Wheel in the centre. To the ends of the Strips is bolted a circle of Flat Girders, connection being made by means of Angle Brackets. Alternate 7½" Strips are provided with 2½" × 1" Double Angle Strips 11, which form bearings for four 5" Rods. A special E1 Motor combined pinion and pulley 10 is fitted to the inner end of each Rod, and these are spaced from the Double Angle Strips by two washers. The Rods are prevented from sliding inward by Collars and at their outer ends each carry a Coupling 8. A lock-nutted Pivot Bolt in each Coupling carries a small Fork Piece 7, which is free to rotate and is fitted with a 6½" Rod. A ½" × ½" Reversed Angle Bracket is bolted to the end of each radial Strip, and to this is secured a Threaded Coupling, and a compound rod consisting of a 3" and a 2½" Rod is held in each Coupling.



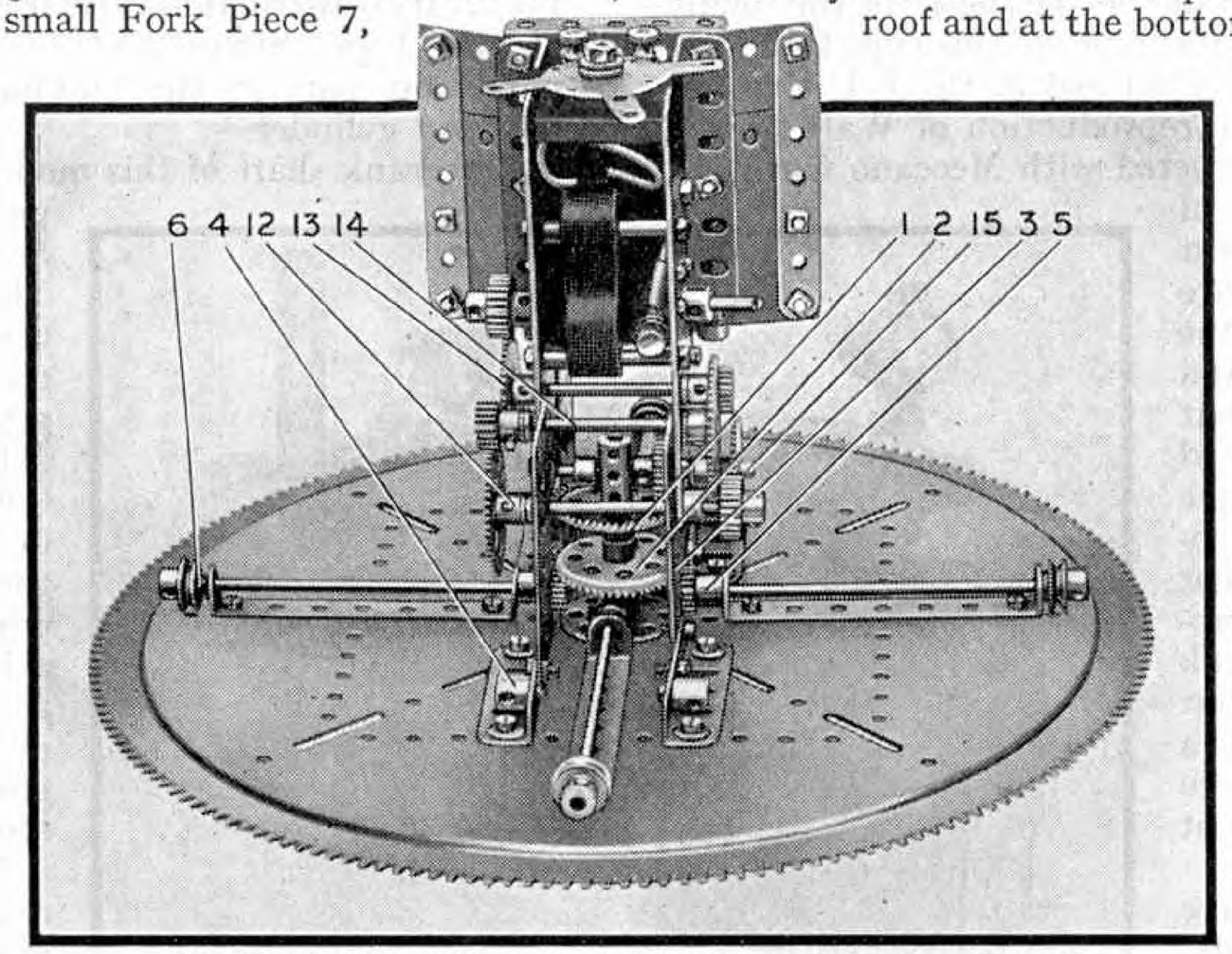
The roof of the model, showing the lighting system and the operating mechanism for the jumping Horses.

The model is provided with 16 Horses (Dinky Toys No. 2A). Eight of these are fixed rigidly in position but the other eight are fitted with operating mechanism that causes them to move up and down as the structure rotates.

In order to mount each Horse, a washer is first of all pushed on to a ¾" Bolt and clamped tightly in place by a nut. A second washer and nut are then screwed loosely on to the bolt, which slides into place between the fore legs of one of the Horses. The first nut fits between the Horse's legs, which are then clamped securely between the two washers by tightening the outer nut.

Each of the 16 Horses is similarly dealt with, care being taken not to damage the legs in the process. The Horses of each pair are connected by 1½" Strips, in the end holes of which the ¾" Bolts are lock-nutted, and the centre holes of the 1½" Strips are used to attach each unit to Collars on the Rods in the Fork Pieces 7. Eight equally-spaced holes should be made in the tinplate or cardboard ring, four of which form bearings for the sliding Rods, while the others enable the stationary Horses to be fixed in place. The holes for the moving Rods of the jumping Horses should be reinforced by 1½" Strips.

When the roof is in position the eight vertical Rods are pushed into the Rod Sockets of the circular platform, and the sliding Rods also are placed in their respective bearings. The lengths of the eight vertical Rods are then adjusted so that the Ring Frame rests evenly on the four Pulleys 6, and the special Pinions 10 engage with the 1½" Contrate on top of the gear-box casing. A Compression Spring and a Collar hold the revolving structure in position, the former making allowance for any inequalities in the moving parts. The stationary Horses are held in place on Rods journalled at the top in the radial Strips of the roof and at the bottom in Couplings secured to the tinplate ring by Angle Brackets.



The Electric Motor and the gear-box. These form a neat and compact unit.

One of the most attractive features of the model is the electric lighting system with which it is equipped. Details of this and the position of the Lamps can be seen in the illustration of the roof of the model reproduced on this page.

The Lamp Holders are held in place by Angle Brackets, and their insulated Screws are connected together, and also to the insulated Pendulum Connection 9, by a length of wire. The outsides of the Lamp Holders make contact with the Flat Girders.

PARTS REQUIRED:

6 of No. 1a; 8 of No. 1b; 2 of No. 3; 1 of No. 4; 12 of No. 6a; 4 of No. 9d; 22 of No. 10; 1 of No. 11; 20 of No. 12; 8 of No. 14; 5 of No. 15; 4 of No. 15a; 11 of No. 16a; 11 of No. 16b; 2 of No. 17; 2 of No. 18a; 4 of No. 23a; 2 of No. 24; 3 of No. 25; 6 of No. 26; 2 of No. 27; 2 of No. 27a; 3 of No. 28; 260 of No. 37; 150 of No. 38; 4 of No. 46; 4 of No. 48b; 1 of No. 53; 26 of No. 59; 17 of No. 63; 8 of No. 63c; 4 of No. 64; 4 of No. 73; 11 of No. 89; 1 of No. 103a; 4 of No. 103b; 16 of No. 111; 4 of No. 111c; 4 of No. 116a; 1 of No. 118; 1 of No. 120b; 20 of No. 125; 8 of No. 133a; 1 of No. 143; 1 of No. 146a; 4 of No. 147b; 1 of No. 167; 1 of No. 167b; 1 of No. 172; 8 of No. 179; 1 of No. 180; 13 of No. 182; 8 of No. 183; 8 of No. 184b; 28 of No. 188; 16 of No. 192; 2 of No. 196; 2 of No. 197; 5 of No. 1561; 13 of No. 1575; 14 of No. 1583; 1 E6 Electric Motor; 4 E1 Electric Motor Pinions; 1 Meccano Pennant; 16 Dinky Toys No. 2a; 1 piece of tin-plate or cardboard 16" × 16".

In Search of New Models

Suggestions for Engine Builders

RECIPROCATING engines undoubtedly are favourite subjects for Meccano model-building. This is scarcely surprising, for the steam, gas, petrol and oil engines included among them can readily be reproduced with splendid effect, and the construction of models of this kind gives scope for ingenuity in devising means of representing a great variety of mechanical movements. In spite of the large number of reproductions of such engines that have already been built, the subject is by no means exhausted, and will continue to provide opportunities for the exercise of model-building skill.

It is impossible to cover the whole ground of the representation of reciprocating engines in Meccano in a single article, for the subject is so vast. Steam engines of course were the first to be developed. The beam engine of the 18th century is a good subject for handsome models, and one of the best of the many Meccano representations of engines of this type that have been constructed is fully described in the F-L Meccano Manual. It is an accurate reproduction of Watt's beam engine that can be constructed with Meccano Outfit K, and incorporates three of the famous engineer's best known inventions. These are the separate condenser, the centrifugal governor, and the sun and planet gear that Watt used for a time instead of the crank, the simple means of changing reciprocating motion into circular motion that is now universally employed. The crank had many advantages, but it had been patented by a rival, and Watt refused to employ it until the patent had expired.

Steam engines have undergone wonderful developments since Watt's time. Engines suitable for all purposes, and for every conceivable position in ships and on land, have been designed, and the variety of types forms an almost endless source of inspiration to model-builders. The reproduction of different kinds of marine steam engine alone would provide occupation for a long time. This attractive model-building subject was dealt with fully in a series of articles that appeared in the "*M.M.*" from March 1934 to August 1934, and described the construction of models of 16 different forms of marine engine. The simplest example was a scale reproduction of the tiny engine of the "*Comet*," the famous pioneer steamship built in 1812 by Henry Bell for service on the Clyde; and the most complicated was a model, also to scale, of the engine room of a turbine steamship. These articles will suggest other attractive subjects to model-builders who are particularly interested in ships' engines.

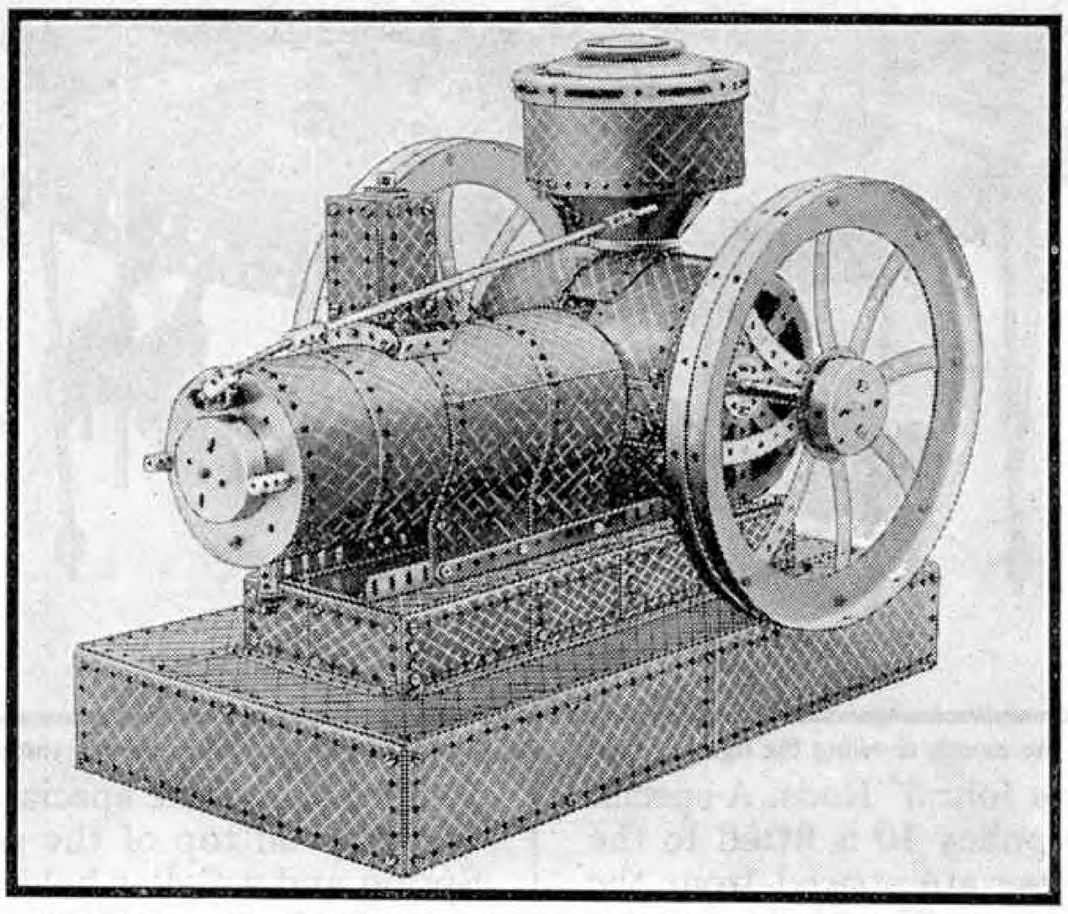


Fig. 1. Strip and Flexible Plates have been used effectively in this model oil engine.

Among the many different types of steam engines designed for general purposes is the over-type unit, an interesting self-contained stationary power plant in which the cylinder and valve-gear are carried above the boiler. An example that can be built with Outfit F is shown in Fig. 2. Its construction is typical of most Meccano models of this type, Strips and Flexible Plates playing an important part in the building-up of the boiler, fire-box and cylinder.

The crank shaft of this model closely follows a design published in the "*Suggestion Section*" of the "*M.M.*" The two Collars used in the construction of each web are connected together by a grub screw. This grub screw is first screwed half into one Collar, and the second Collar is then passed on to the remaining half. The crank pin, a 1" Rod, carries a Large Fork Piece forming the big end. The simple method of building the governor fitted to this model also is worthy of note.

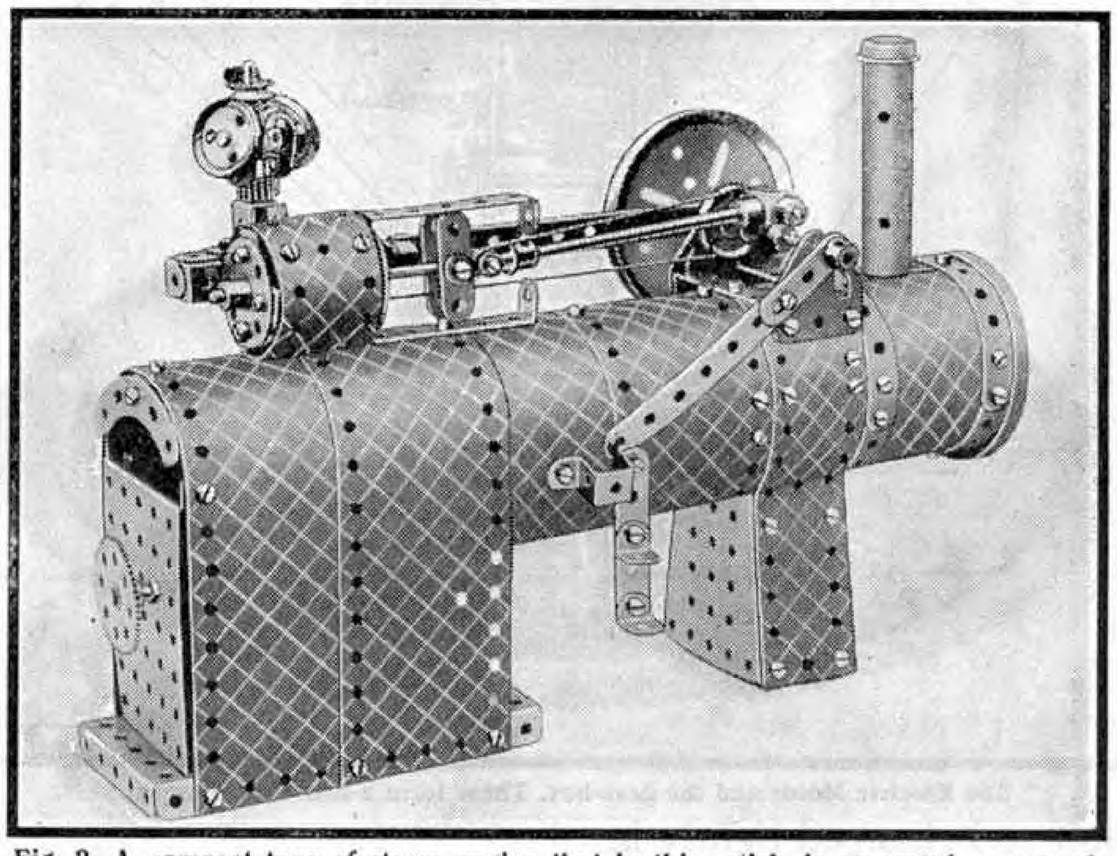


Fig. 2. A compact type of steam engine that in this article is suggested as a good subject for model-building.

Towards the end of last century, while engineers were striving to increase the efficiency of the steam engine, a few experimenters were endeavouring to burn fuel in the cylinder of an engine instead of the fire-box of a boiler. Their work has given us the modern internal combustion engine, using gas, petrol or oil. Gas engines were the earliest to be developed, and these were so efficient and free from trouble that they began to

replace steam engines in mills and pumping stations, and came into use for many purposes.

Modern gas engines form excellent subjects for Meccano models, built with both large and small outfits. A single cylinder unit of this type closely resembles a steam engine in general design, but the valve gear usually is more complicated. Fig. 3 illustrates a model, built with F Outfit, that represents a typical single-cylinder gas engine. The most pronounced feature is the massive flywheel. This is essential in a single-cylinder engine of this type, for the power of the explosion of the mixture of gas and air is effective during only one of the four strokes of the cycle employed, that is once during two revolutions of the crankshaft. The momentum of the flywheel helps to give steady movement throughout the cycle. In the model a realistic flywheel is built up of a series of carefully bent $5\frac{1}{2}$" Strips that overlap each other two holes. The two coincident circles of Strips, shown in the photograph, are secured together by means of four Flat Brackets.

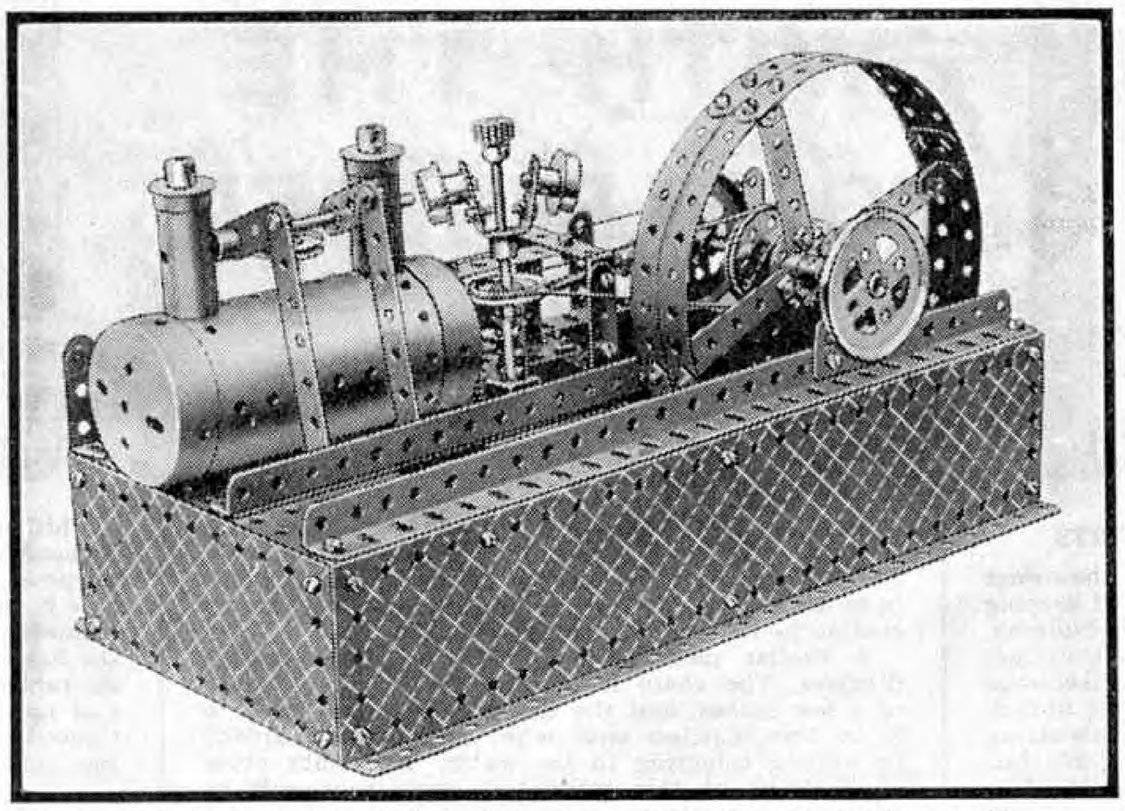


Fig. 3. This modern single-cylinder gas engine can be built with F Outfit.

Complicated fittings have been reproduced in the model in the simplest possible manner. It is always a mistake to overburden a small model with a wealth of details, for these tend to hide the characteristic features of the subject. This is very important from the point of view of appearance, for the general effect of a well-built model can be completely ruined by endeavouring to introduce too many fittings, especially when these cannot be well proportioned. The valve-gear of the model under discussion consists merely of two Cranks, mounted on a Rod, and two $3\frac{1}{2}$" Strips secured to the ends of the Cranks. The governor also is simple, but is very effective.

A vast field has been made available to the model-builder by the rapid growth of the modern heavy oil engine. The model shown in Fig. 1, the prototype of which is a Petter "S" type, two-stroke cycle engine, is an excellent example. The original is a popular light engine of about 12 h.p. and its simple design makes it a very suitable subject for even quite small models. In reproducing it good use is made of Strip and Flexible Plates, especially in the construction of the "hot bulb" that in practice heats the heavy oil fuel before it is admitted into the cylinder. The large twin flywheels form another notable feature.

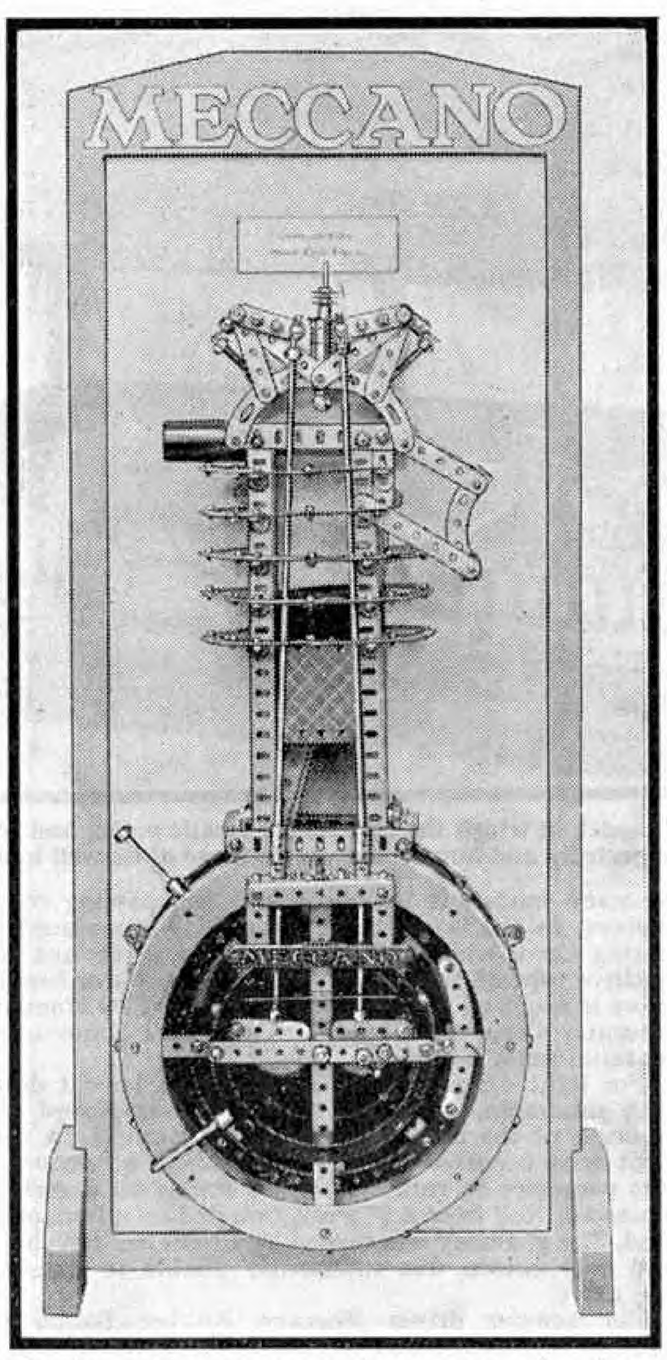


Fig. 4. A fine demonstration model of a four-stroke motor cycle engine.

A Meccano model engine that attracts much attention is shown in Fig. 4. This is a demonstration model of a single-cylinder petrol engine of a type used in hundreds of motor cycles and small boats, and every detail of operation is shown clearly and faithfully. Similar methods of construction can be applied to all classes of reciprocating engines, and excellent examples of multi-cylinder engines, including a fine four-cylinder demonstration model petrol engine for use in schools and engineering classes, have been built from time to time.

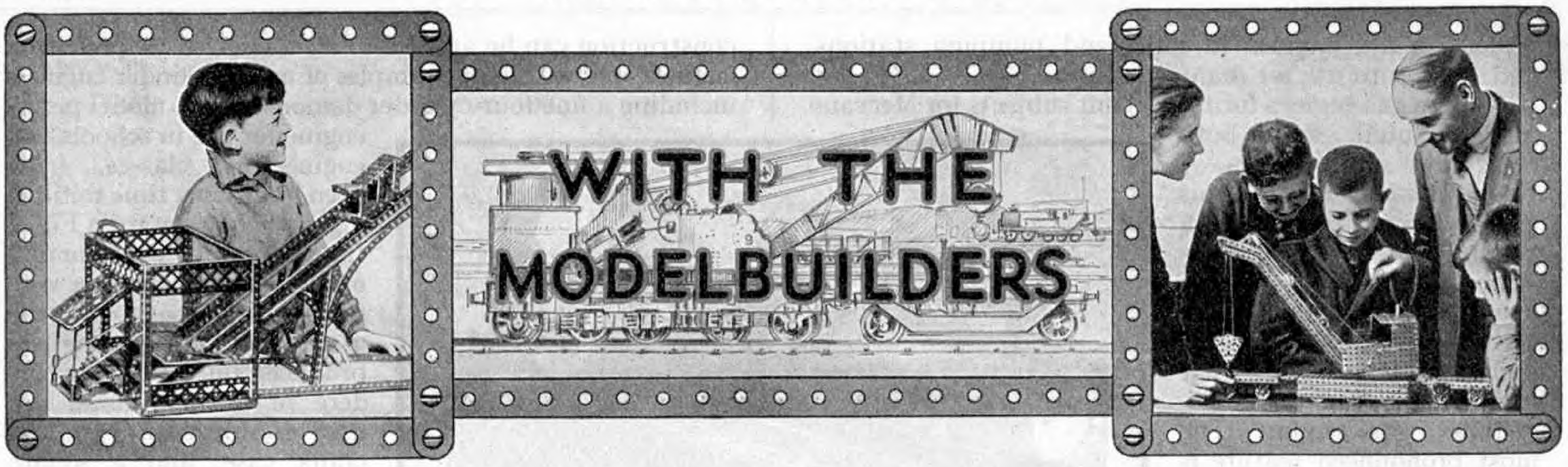
As will be seen from Fig. 4 the framework construction of models of this nature is as simple as possible, the mechanism only being reproduced fully. Circular Girders or Ring Frames are used to form an excellent crank case, and a square structure of Angle Girders is all that is necessary for the cylinder. Cooling fins represented by Curved Strips can be fitted if desired.

The exhaust pipe is reproduced by a framework of Strips, but the inlet is cleverly represented by a Funnel. This latter part can be used with equal success in small model oil engines to represent the cylinders. Ingenious use of Meccano parts also is seen in the construction of the sparking plug, in which Small Discs from a Meccano "X" Outfit have been used to form the cooling fins. The lower end of this plug is fitted with a 4.5 volt bulb that flashes at the beginning of each firing stroke to represent the explosion of the fuel mixture. This bulb is operated from a contact on one of the cam shafts and forms an interesting addition to the model. Strip Plates and 3" Pulleys are used in the construction of the piston.

Valve-gears and governing appliances are interesting subjects for reproduction in Meccano, and the various movements involved can readily be built and provide opportunities for the exercise of a little ingenuity. Models of governors have been described from time to time in the Magazine.

The valve gears of Walschaerts, Joy and Stephenson often are reproduced in model locomotives and marine engines. There are others of which models are seldom made, however, among them the valve-gears and link motions invented by Hackworth, Allan, Bremme and Gooch, all of which have their instructive value and can be well recommended for their general interest. A little time spent in "hunting" for interesting mechanisms of this kind in books dealing with engines, many of which can be consulted in a reference or lending library, is never wasted, and should lead to some really good and novel ideas for model-building.

Interest can be added to model engines by making them work, with pistons moving backward and forward and crankshafts turning. This can be accomplished by using Meccano Elektron Magnet Coils and Cores to represent the cylinders and pistons. Models of this kind will be described in subsequent issues of the *"M.M."*



KEEPING CHECK OF MECCANO PARTS

One of the many problems that confront the owner of a large selection of Meccano parts is that of keeping a check on the material available for model-building. If the stock of each part is known before the construction of a model is commenced, there is little likelihood of the builder having to postpone work owing to lack of parts. Commencing a suitable filing or tabulating system necessitates a certain amount of work, but time and trouble spent on it is more than repaid.

There are various methods that may be employed to keep a check on a collection of parts. In one of the simplest and best, the names of all the Meccano parts are written down in correct order, together with their list numbers, on the left side of the required number of sheets of foolscap paper, or of the pages of a small note book. The lists of parts to be found in Meccano Manuals and catalogues give the complete range. The rest of the space available is ruled off with vertical lines placed ¼" apart.

It is then necessary to take stock and enter the numbers of each part in the appropriate space in the first column. The number of any part in stock can be found immediately from this list, which is kept continually up-to-date by inserting revised totals in the following columns when new parts are acquired. The stock can be checked periodically, and the date on which this is done should be placed at the head of the column giving the result.

SPLIT WASHERS

The need is often felt for some means of preventing nuts and bolts from working loose, especially in models, such as high speed engines, motor chassis and automatic machines, that are subject to considerable vibration and are liable to work loose when running for long periods. It is therefore advisable to fit some locking arrangement to the bolts used in all reciprocating and oscillating parts.

The usual method of locking in practice is by a split washer, as this causes a constant pressure between the thread of the bolt and that of the nut. There is no part of this kind in the Meccano system, but ordinary Washers, Part No. 38, can readily be cut and bent to form very efficient split or spring Washers. The rim of each Meccano Washer must be cut completely through at one point with the wire cutting edges of an ordinary pair of pliers. The two ends so formed are twisted about 1/32" apart. When the split Washer is held tightly underneath a bolt head, this gap is closed and a slight pressure is applied to the bolt.

Another easily made type of split washer can be formed from two complete turns cut from a Compression Spring, the washer so formed being similar in appearance to a key ring. In practice, washers of this type are used only where it is necessary to apply slight pressure to a bolt or where a shaft is to be allowed a little side movement. When used for the latter purpose, the washer is held between the main bearing and a collar fixed on the shaft.

AN UNUSUAL SPROCKET DRIVE

The Meccano model fair ground "Dodgem" illustrated on this page, is fitted with an unusual Sprocket Chain drive. Each of the eight cars in the model is connected by a piece of strong but flexible steel wire about 6½" long to a length of Sprocket Chain, hidden in the roof of the model, that runs in a horizontal plane and passes round a number of Sprocket Wheels of different sizes secured at various points. One Sprocket Wheel is driven by a concealed Electric Motor, and a second Sprocket is mounted on the end of a spring loaded arm to act as a jockey sprocket and take up any stretching of the Chain.

The fine steel wire is looped through the chain so that it does not catch on the Sprocket Wheels. As the chain rotates, the cars are caused to move in an irregular path, thereby creating an effect exactly similar to that of the actual machine.

A similar mechanism is used in model marine displays. The chain is then submerged to a depth of a few inches, and the model ships are secured to it by thin, rustless steel wire. The chain is hidden by adding colouring to the water. No doubt other applications of this interesting movement will be apparent to model-builders.

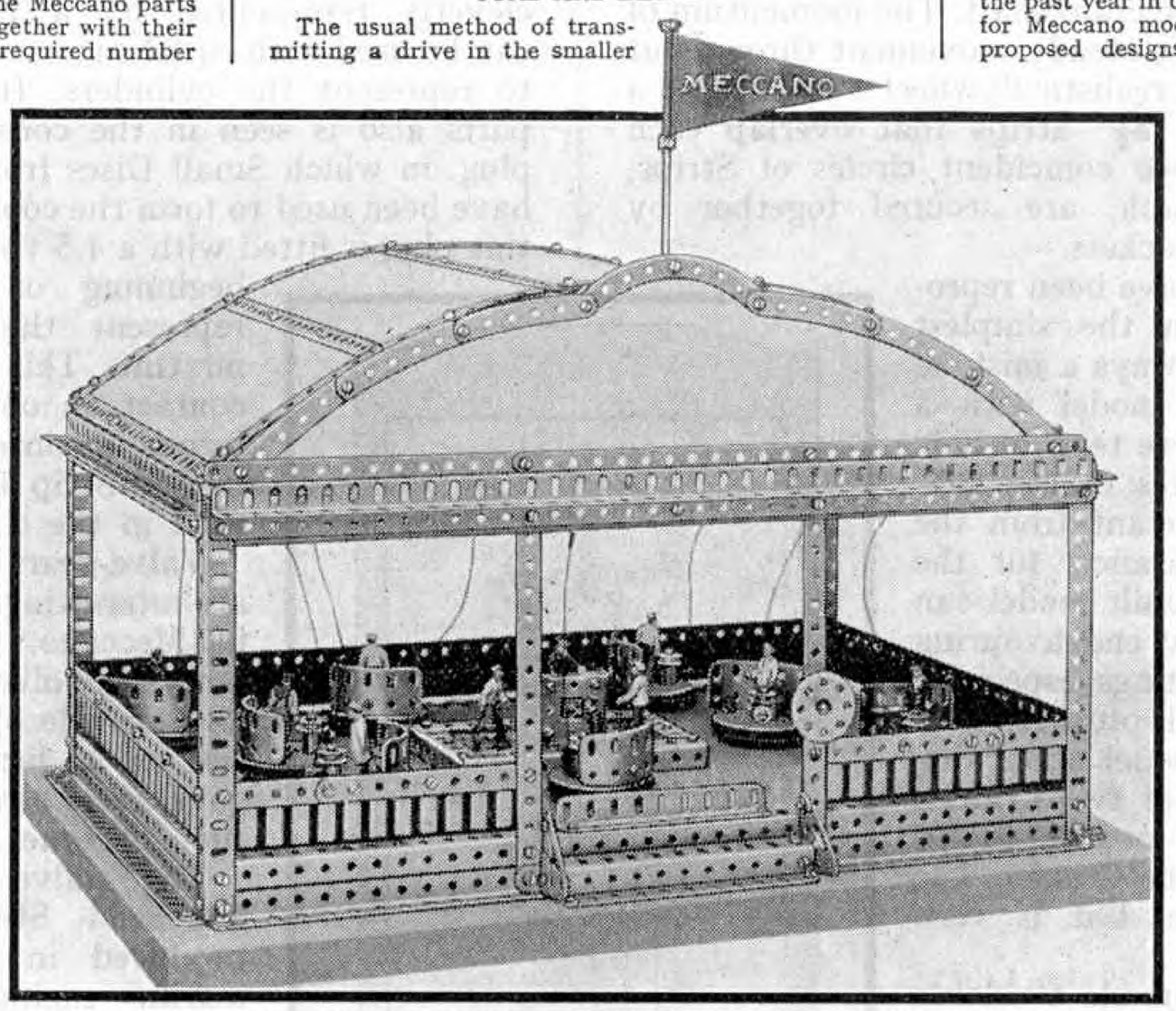
CORD AND BELTS

The usual method of transmitting a drive in the smaller Meccano models is by means of Cord passing round pulleys. In the larger models the Cord is replaced by Spring Cord, which provides a far more efficient and positive type of drive. Occasionally a lighter or heavier drive is required than can be transmitted by standard Meccano Cord, and in these instances some other material must be used.

For light drives, where friction must be cut down to a minimum, cotton or silk can be employed. An example of the use of cotton for transmitting a very light drive occurred recently in a model governor. It was necessary to rotate a 1" fast Pulley on a vertical Threaded Rod from a ½" Pulley carried on a horizontal Rod. The ½" Pulley was turned by a light friction clutch and only cotton was sufficiently pliable to transmit the drive.

For heavier drives Meccano Rubber Bands are extremely reliable, but are not really suitable if it is desired to reproduce wide belting. Dressmaker's tape and strips of canvas may be used with good effect in such circumstances. The two ends of the miniature belts can be sewn together, or linked by means of wire clips.

For really powerful drives, where Meccano Cord is not sufficiently strong or is liable to slip, it is a good plan to use bootmaker's twine. This is a special waxed thread of great strength and, although no thicker than Meccano Cord, it is capable of transmitting remarkable power without any trace of "slip." It can be purchased in lengths from almost any boot repairer for a few pence.



A Meccano "Dodgem" model, in which the cars follow erratic paths, and collide with or dodge each other, as unexpectedly and humorously as do those of its well known prototype.

This material was used in a large Meccano Model Pithead Gear that was specially built for demonstration purposes at a recent engineering exhibition. In this case it was necessary to drive a hoisting drum, of 12" diameter from a reversing mechanism concealed below the base board of the model. Sprocket Chain was not desirable for mechanical reasons, and Meccano Cord had not sufficient strength to stand weeks of continuous running. The bootmaker's twine served the purpose admirably.

CREEPER TRACKS

Many suggestions have been submitted during the past year in connection with creeper track suitable for Meccano model tractors, tanks, cranes, etc. The proposed designs vary from simply moulded rubber belts to more complicated stamped-out metal squares, usually interlocked with each other or bolted to lengths of Sprocket Chain. These suggestions are now being carefully considered.

At present it is possible to build efficient creeper tracks with standard Meccano parts. Continuous lengths of Sprocket Chain passing round a number of Sprocket Wheels have a realistic appearance. Rubber Bands also may be employed with good effect when passed separately round pulleys or in the form of a solid track round Flanged Wheels.

A neat form of endless track that is particularly suitable for small models can be constructed from Hinges. The required number of Hinges are secured rigidly together by nuts and bolts, the bolt heads being inward, and the complete belt is passed round Flanged Wheels at each end. To enable the bolt heads to get a grip, the driving Flanged Wheel should be fitted with two or three small Meccano Rubber Bands. Alternatively, a thin strip of strong paper may be passed round the wheel and held in position by glue.

TAPERED FUSELAGE FRONT.—When building models with Meccano Aeroplane Constructor Outfits, it is only possible to represent aeroplanes having comparatively flat noses, a construction that gives a fore-shortened appearance to models. To overcome this the introduction of a special part has been suggested. This new part would be cast, and would be similar in shape to the forward end of many British interceptor fighters, the best known of which is probably the Hawker "Fury." This part would certainly add a touch of realism to the aeroplane models, and the idea will be kept in mind for further attention. (*Reply to A. Wolsterholme, Blackpool.*)

REMOTE CONTROL APPARATUS

Many readers no doubt have examined or built the double-acting relay described in the Suggestion Section of the "*M.M.*" for February last. This is accurate and reliable, but appears to have one fault that has been discovered by V. N. Spencer, Bristol. When the relay is in the "off" position there is a low-tension leak through the coils. This point appears to have been overlooked by its builder F. Jenkins, Birmingham, but, as V. Spencer points out, it can be readily overcome by adding an extra contact or a fourth magnet.

The fourth magnet would operate a contact that must be incorporated in the wiring to the set. It is simpler to add an extra contact to the arm 5 however, and this can be used to operate the set. The contact and set would then be isolated from the relay and no leakage could possibly occur. With this latter arrangement, great care must be taken to see that both Silver Tipped Contact Screws on the arm 5 are in contact together.

Building a Model Theatre

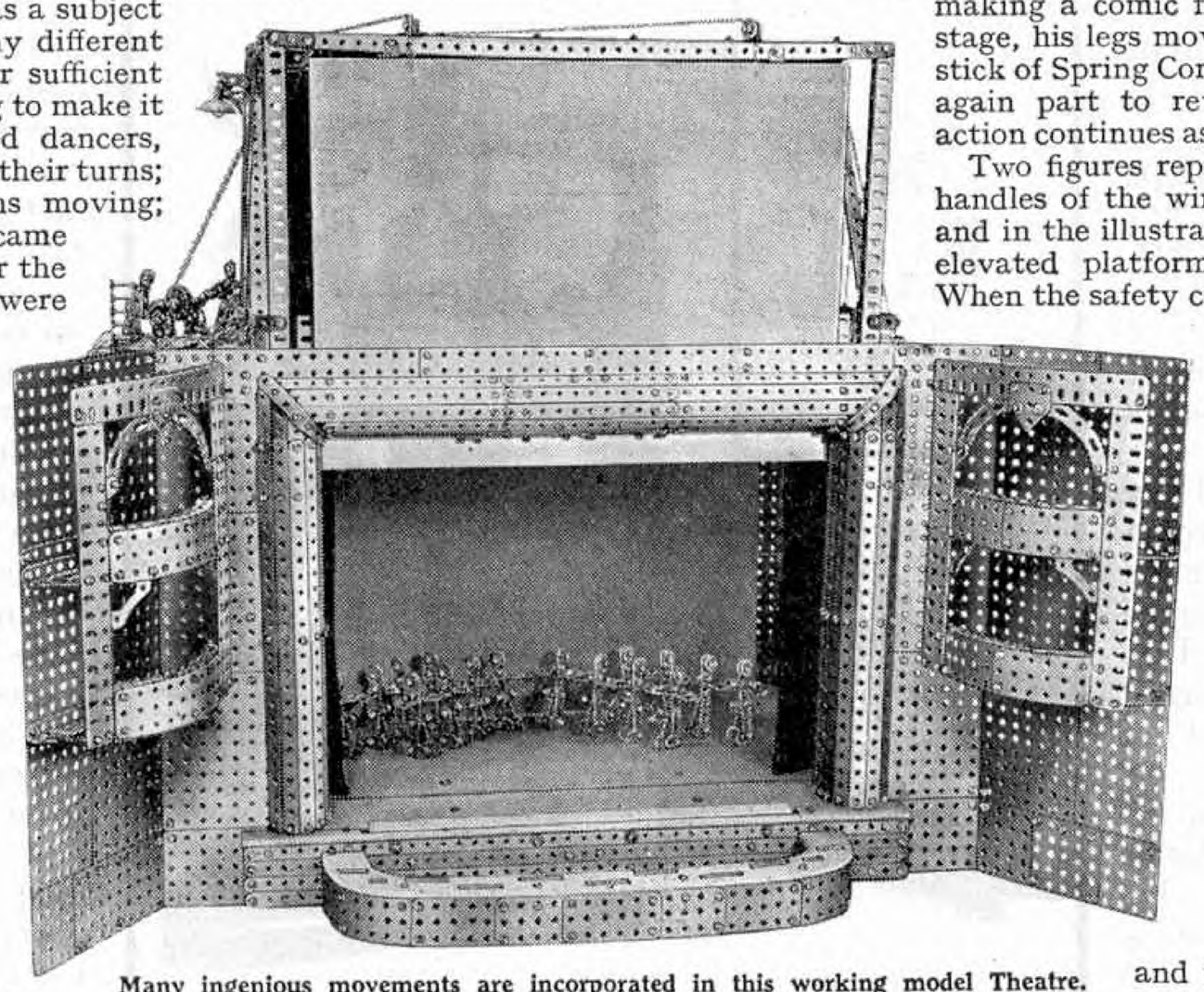
A Fascinating Subject for Animated Models

By "Spanner"

WHEN seated comfortably among the audience in a theatre I have often marvelled at the brief time taken to effect a complete transformation of the stage, and have wondered how all the effects are produced. An opportunity for finding out what happens behind the scenes came to me unexpectedly, and in a manner that could not have been more pleasing. The manager of a large theatre had the excellent idea that Meccano could be used for building a model of the stage to show to the public its essentials, so that they could see for themselves how things worked. He wanted the stage to be copied exactly, with all the moving scenes and usual properties, and thought that a few performing figures would add to the interest of the model, which he required to be working continuously when exhibited.

At first this seemed rather an ambitious scheme, but on thinking it over I realised that here was a subject that could be treated in many different ways, and one that called for sufficient ingenuity and careful thinking to make it truly fascinating. I visualised dancers, acrobats and comedians doing their turns; scenes changing and curtains moving; and at length my brain became almost bewildered by ideas for the complicated gear trains that were to achieve all this.

My first step was to visit the theatre while a performance was in progress. I was conducted through fire-proof doors to the back of the stage and was surprised at its great size in proportion to the part seen by the audience. Limelights were mounted on pedestals in the wings, and other powerful lamps were fixed on long batons suspended above the stage. Down each side of the proscenium front was a row of several dozen lamps shaded from the audience but glaring fiercely on to the stage. The footlights also contributed their share of brilliancy, and in addition three limelights situated in the auditorium were brought into use when the occasion demanded. All this illumination showed that much scope exists for arranging lighting effects in a model.



Many ingenious movements are incorporated in this working model Theatre.

The back of the stage and wings were in comparative darkness, and above my head I noticed a number of small lamps glowing red and green before a platform built out from the wall. There was the huge switchboard from which the electrician controlled the lighting effects. What each switch was for I did not learn, as the electrician was far too busy operating them to answer the many questions I would have liked to ask.

I was then led up a vertical ladder on to a platform high above the stage, to find myself almost surrounded by rows of ropes, pulleys and cleats. I stood beside the painted canvases that make up the scenes and hang vertically from pulleys some 40 ft. to 50 ft. above the stage, and in one corner of the platform was a powerful winch for raising and lowering the fire-proof safety curtain, with hydraulic cylinders to control its movement.

On leaving the theatre I considered all the possibilities that were opened up for a new model. So many ideas seemed to occur that it was difficult to decide which to apply and which to reject. It became clear that as the performers in the model would be small, and could not be reproduced in detail, they must necessarily be identified by their actions. The movements must be operated automatically and timed to occur at the right moment if the model is to work continuously without attention. This timing of the different movements promised to prove the greatest difficulty.

The general construction was fairly straightforward. To obtain correct proportions another visit was made to the theatre, and with a surveyor's tape and a note book rough sketches were made of the principal parts of the structure, with the chief measurements indicated to form a guide when building the model. A front view of the completed model is shown on this page. Finished in the new colours of blue and gold it looks very attractive indeed, and when the stage is provided with painted scenes and lit up it is most realistic.

The 16 figures shown on the stage represent dancers. They are arranged in four rows of four each, two rows being on each side of the stage. Each figure vigorously kicks one leg forward, those in the front rows operating together first and those in the back rows then following their example, the movement going on continuously. After a while the side curtains, made of black velvet, close to the centre of the stage, and a comedian walks across in front of them, making a comic figure as he glides across the stage, his legs moving and his crooked walking stick of Spring Cord shaking. The black curtains again part to reveal the dancers, and their action continues as the safety curtain is lowered.

Two figures represent the men who turn the handles of the winch for lowering the curtain, and in the illustration these can be seen on the elevated platform to the left of the stage. When the safety curtain reaches the stage level, there is a brief pause, during which the side curtains close, and it is then hoisted up again. After the comedian crosses the stage the side curtains part and the cycle is repeated.

At the back of the stage of the actual theatre there are two massive columns of masonry for supporting the upper platform and part of the theatre roof. These are reproduced in the model and one of them serves to accommodate the gearing for the operating mechanism. There are three automatic reversing gears, driven by an Electric Motor, and these control the raising and lowering of the safety curtain, the parting and closing of the side curtains, and the movement to and fro of the comedian. The reversing gears are carefully adjusted so that the three operations are carried out at the correct time in relation to each other, and slip clutches are incorporated to allow for overdrive.

Dancers like those used in this model could be incorporated in any model theatre as they are of simple construction and require only few parts. They are made as small as Meccano parts will allow without loss of correct proportions, each of the figures shown being made of a 2" Strip for the body and a 1½" Strip for one leg. These Strips are joined together by a ¾" Bolt serving as a pivot for the Crank that forms the other leg. A ½" Pulley is used for the head, and Flat Brackets fixed to Angle Brackets serve as arms. Further Flat Brackets represent feet. The Crank is used instead of another 1½" Strip so that a Set Screw can be locked in its boss for attaching the operating cord.

A short piece of cord is tied between the Set Screw and the loop in the upper end of a wire that passes through a small hole drilled in the stage. Cord is used on account of its flexibility, but it is necessary to use wire for passing through the hole in the plywood stage. The kicking movement is obtained by attaching the operating wires for each row of figures to a Rod beneath the stage. At each end of the Rod is an Eye Piece sliding on vertical Strips, and cams built up of Collars and bolts raise and lower the Rod.

To produce the walking movement of the comedian the legs are extended so that they pass through a long slot cut in the stage, and are operated by an Eccentric driven by Rack and Pinion.

Testing Steels for Hardness

A Novel Use for the Diamond

By W. E. Glover

THE modern engineer makes great use of special steels and alloys, and it is necessary that he should have exact knowledge of their characteristics in order that he may employ them to the greatest advantage. One of the most important properties of a metal with which he is concerned is its hardness, upon which its behaviour in service largely depends. Until a short time ago the chief method of ascertaining hardness was by means of what is called a Brinell test, in which a hardened steel ball is pressed into the specimen to be tested. The size of the impression is then measured and compared with a fixed scale showing how standard materials of different grades of hardness would respond to the same pressure. Naturally there are limitations to the use of this method. For example, if the ball is pressed into a steel that is nearly as hard as itself, the result cannot be accurate, for the ball also is affected and made to lose its shape.

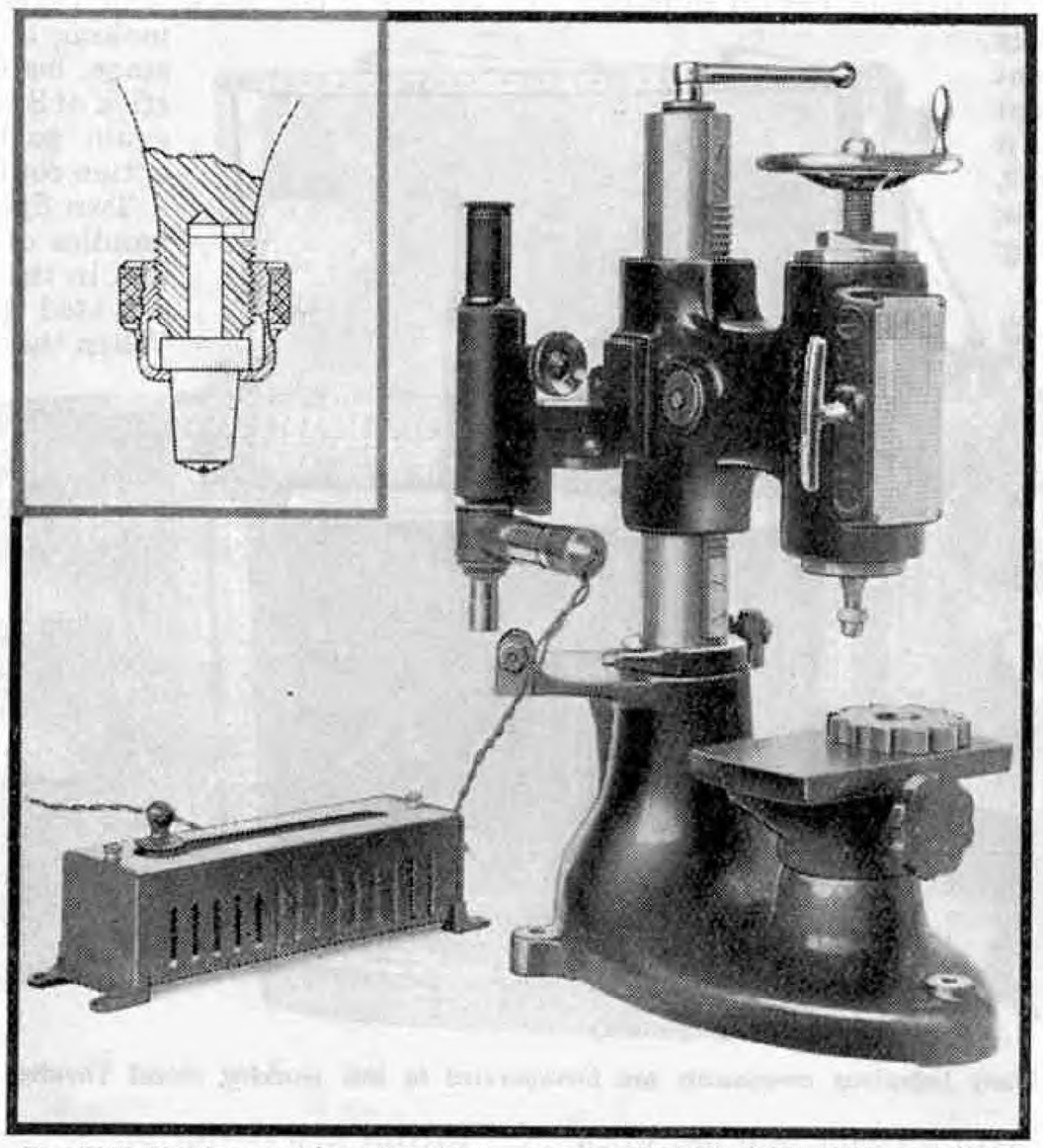
A machine introduced by Thomas Firth and John Brown Ltd., Sheffield, has now made possible far more accurate measurement of hardness. It is known as the "Firth Hardometer," and is illustrated on this page. The principle on which it works is similar to that of the Brinell test, for it includes a hardened ball indenter, but in addition it is fitted with a diamond that also can be pressed into test pieces in exactly the same manner.

The diamond used in the Firth hardometer is carefully selected, cut and polished. It has the standard angle of 136 deg. between opposite faces, and is set in a special holder. Unlike the balls used for the Brinell test, it does not vary in quality to any appreciable extent and gives consistent results. The machine therefore has opened up a new field for accurate work, and can be used to test specimens of any hardness up to that of the highest speed tool steel

The article to be tested first has to be prepared, for most metals bear a skin of material that is either harder or softer than the internal bulk. This skin is filed or ground off, and the new surface is then polished with a very fine emery in order to remove scratches and to provide a good measuring surface. The article is then supported on the anvil, as shown in the accompanying illustration, and the diamond is moved downward into contact with it by means of a hand wheel. Approximately a complete turn is then made, and finally the movement is automatically arrested when the exact load required for the test has been applied. This load is applied to the test piece through a spring.

The size of the impression produced must then be measured. For this purpose the head of the machine is swung round on its axis until the microscope, seen on the left of our illustration, is immediately above the mark made by the diamond. This carries a horizontal side tube in which is placed a lamp to illuminate the test piece, the light being reflected on to the specimen by means of a strip of glass placed in the body of the microscope, and at an angle of 45 deg. to its axis. The magnification varies between 80 and 210, according to the type of the machine.

The microscope is fitted with a micrometer scale to enable the size of the impression to be read directly. This is a satisfactory and accurate method of measuring, but has certain disadvantages when many measurements have to be made. One of these is the eye strain that frequently occurs when work is practically continuous. This difficulty has been overcome by fitting over the eye piece of the microscope an ingenious device that projects an enlarged image of the impression to be measured on to a slotted ground glass screen. This screen is in the front vertical face of the head and is marked with scales for purposes of measurement. A sharp image free from distortion is obtained and the necessary readings can be carried out easily and rapidly.



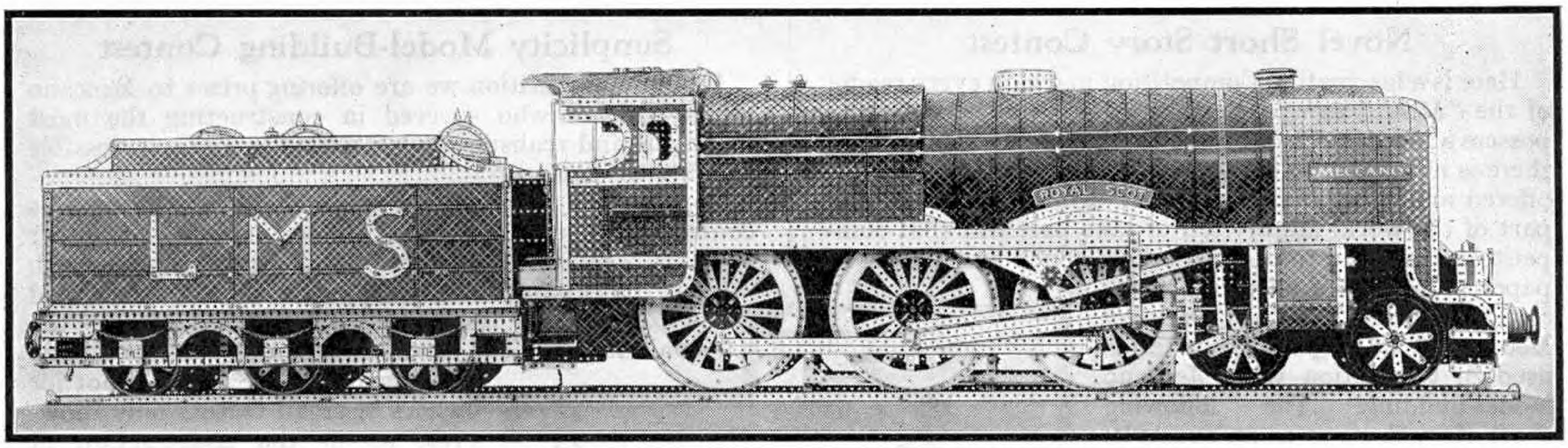
The Firth Hardometer, in which the hardness of metals is measured by pressing a diamond into test pieces. In the upper left hand corner is a sectional drawing, on a larger scale, of the diamond holder. Photograph by courtesy of Thomas Firth and John Brown Ltd., Sheffield.

For soft metals and those of medium hardness the ball indenter is satisfactory, but for harder metals the diamond indenter gives better results. A certain minimum thickness is necessary in the materials to be tested. This depends on the load, the choice of indenter and the hardness of each specimen. Generally it is best to have a minimum thickness of seven times the depth of the impression when a ball indenter is used, and of $10\frac{1}{2}$ times when a diamond indenter is employed.

A metal or alloy tested by means of a ball indenter is given a Brinell number, that is a number indicating its relative position on a hardness scale. A standard ball 10 m.m. in diameter is used and the number is decided by dividing the pressure on the ball, measured in kilograms, by the area of the indentation, in square millimeters. The same method is used in expressing the hardness of a metal tested by means of the diamond indenter, and this gives a second scale of what are called diamond hardness numbers.

The "*Royal Scot*" Reproduced in Meccano

A Fine Exhibition Model



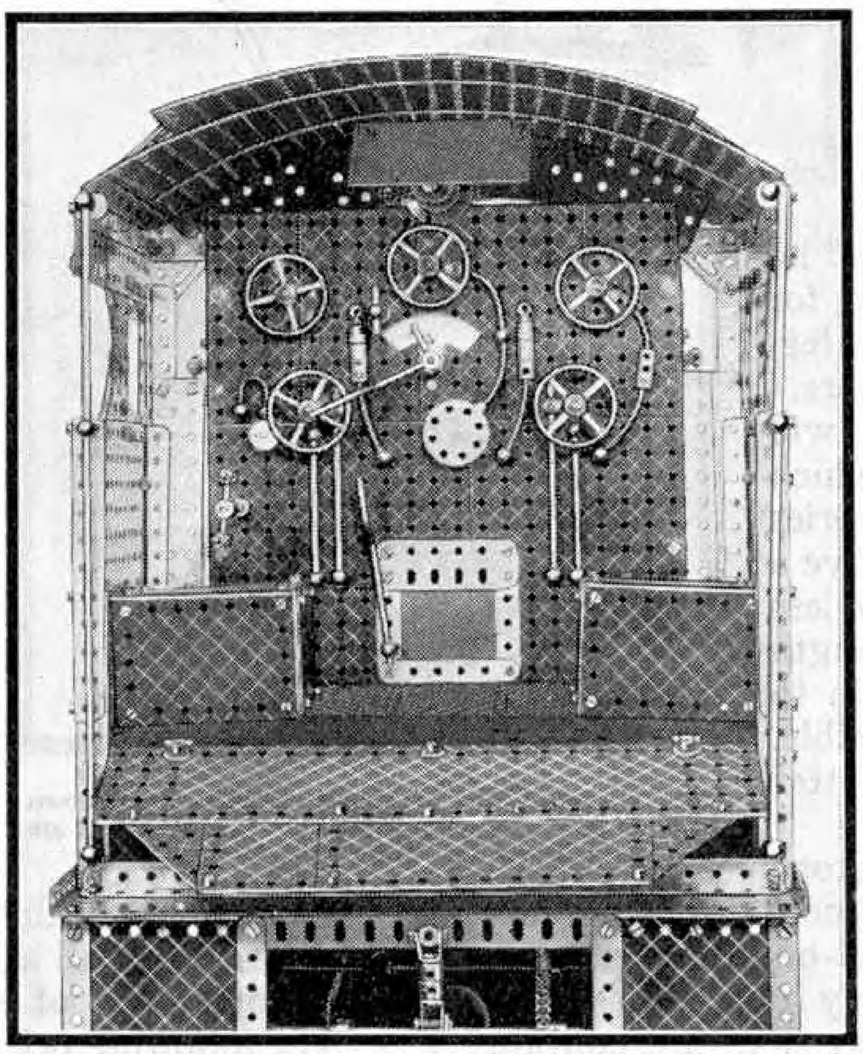
ON this page we illustrate a fine model of the famous L.M.S.R. locomotive "*Royal Scot*," built recently for exhibition purposes. The model is made entirely from Meccano parts, and readers who are familiar with the actual locomotive will appreciate the wealth of detail work it incorporates. In the red, blue and gold colours of the Meccano system, the model presents a fascinating appearance, and by manipulation of a lever in the cab it can be set working in a most realistic fashion.

For demonstration purposes the model is mounted on a stand, and in order that the mechanism may be set in motion without the model itself moving, the locomotive is raised from the rails by means of a strong framework of Angle Girders. The operating power is provided by an electric motor, which drives the wheels through Sprocket Chains and at the same time causes the valve gear to operate. The interior of the cab is illuminated by an electric lamp.

The driving wheels are made from Ring Frames, with flanges formed by circles of 4" Curved Strips, and are interconnected by built-up connecting rods, each made from six 12½" Strips, which are mounted on short Rods secured to the wheels by Double Arm Cranks. Serviceable balance weights for the drivers are provided by a number of 4" Curved Strips.

One of the most remarkable features of the model is its graceful lines, which have been made possible by judicious use of the newer Meccano parts. An example of this is to be found in the cylinder block, which is made from Strip Plates. Inside a casing of these are fastened two 3" Pulleys and a Boiler, the former representing the ends of the cylinder and the latter the valve chest. The crosshead is built up from two channel section girders made from 1½" Angle Girders, and bolted to a Coupling and a Strip Coupling. Each of the channel girders is fitted with two Threaded Pins, and these carry Eye Pieces that slide on guide bars made from two parallel Strips. The Strip Coupling is connected to the centre pair of driving wheels by means of a connecting rod.

Strip Plates are used also to a large extent in the construction of the boiler, cab, and fire-box. In the case of the boiler the Strip Plates are bolted to Ring Frames, and it will be noticed that by this method of construction a remarkably neat appearance has been obtained. The smoke-box door is provided by a Circular Strip and a 6" Circular Plate, and four Handrail Supports are secured to the latter to carry a Rod that represents the front handrail. The chimney is made from three Wheel Flanges, on top of which is a 3" Pulley and then a fourth Wheel Flange, all these being held in place on a Screwed Rod passed through their centres.



The upper illustration shows a splendid model of L.M.S.R. No. 6100, "Royal Scot." The cab of this model is seen in our lower illustration.

The lower illustration on this page shows the interior arrangement of the cab. All the fittings and handwheels are copied as closely as possible from those in the cab of the actual "*Royal Scot*," and it will be noticed that the new Meccano Steering Wheel plays an important part in giving the model an appearance of reality. Those used are mounted on Threaded Pins.

The electric motor that drives the model is controlled from the regulator seen in the centre of the control panel. The regulator quadrant is a Rack Segment and this holds a short Rod that carries a Hexagonal Coupling; a Crank Handle and a 1" Rod form the hand lever and pointer respectively. The regulator operates by actuating the tumbler of an ordinary house lighting switch, which is fixed inside the fire-box and connected in the electric circuit of the driving motor. A realistic pressure gauge is made from a ½" fast Pulley connected to two Handrail Supports by a bent Flexible Coupling Unit.

Novel Meccano Competitions Open to All

Prizes for "M.M." Readers

Novel Short Story Contest

Here is a fascinating Competition in which every reader of the "*M.M.*" can participate as it is not necessary to possess a Meccano Outfit to be eligible for the Contest and there is no model-building to do. A range of fine prizes is offered and boys and girls of any age and living in any part of the world are invited to take part. All that competitors are asked to do is to take a pencil and a sheet of paper and write a short story incorporating the names of as many Meccano parts as possible or terms used in connection with Meccano model-building. The following short story is given as an example: "Pawl was playing with a Ball near a Motor Tyre store, when the Boss, who was a Crank by nature, Loomed up in front of him. 'Hook it, or I'll Collar you,' growled the old Buffer. Just then a Dog Clutched the Ball and tried to Bolt with it. Pawl wheeled round to Grab the dog, but only pinioned the Boss, who tore himself out of Pawl's Clutch and stepped on a Curved Strip of banana skin. He fell, waving his arms like Windmill Sails. 'You Worm!' he shouted, but this ended the Ball Race, for the startled dog coupled itself to his leg, and tore a Circular Strip from his trousers."

Study of the Meccano price list will reveal dozens of parts, the names of which can easily be incorporated in short stories of this kind, and it is great fun to weave a story round them. Stories must not be less than 50 or more than 150 words in length and it should be the competitor's aim to make his entry as humorous as possible. The more amusing a story is, the better will be its chance of winning a prize.

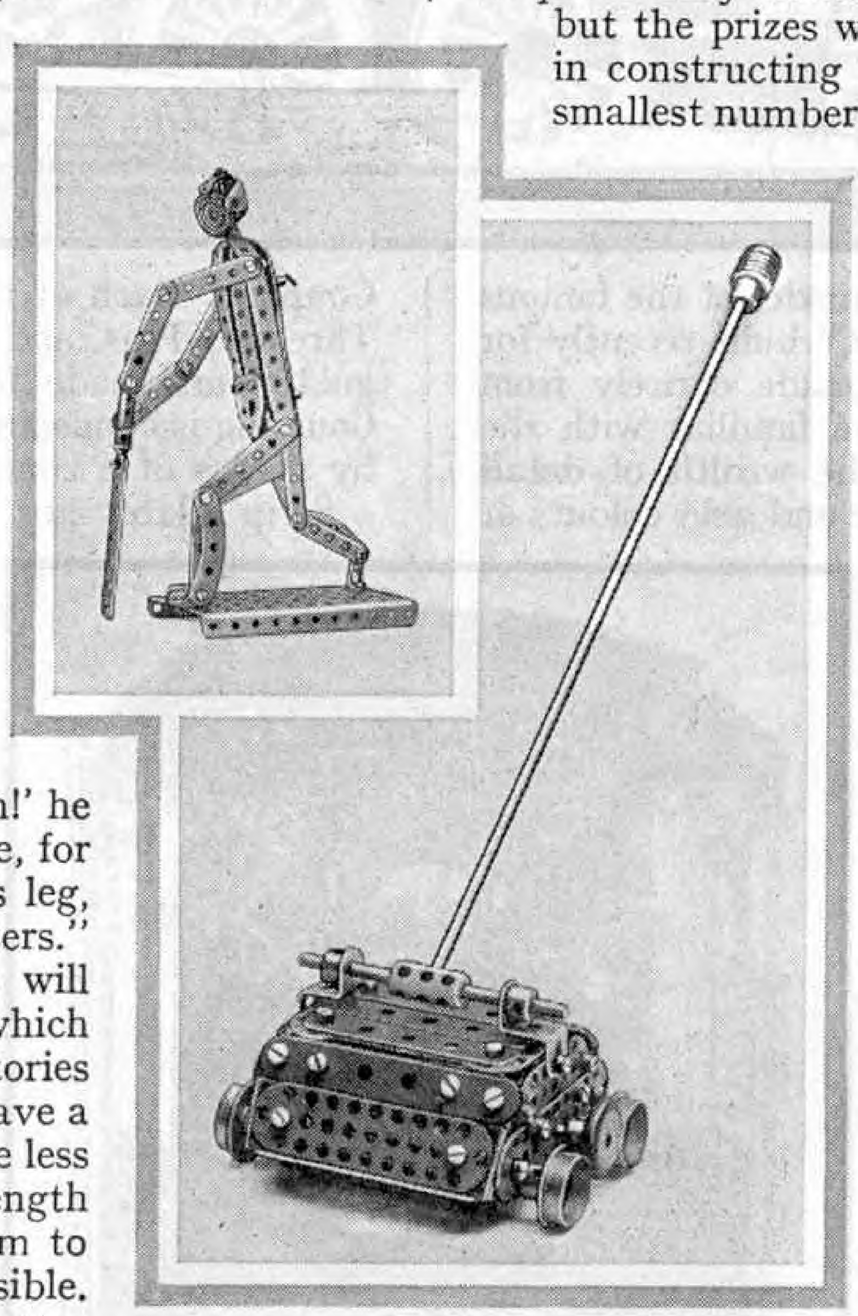
The prizes will be awarded for the story that is the most humorous and which contains the greatest number of part names and model-building terms.

Competitors may send in as many different stories as they wish provided that each story does not contain more than 100 words. No competitor, however, will be awarded more than one prize.

There will be one Section only and the prizes to be awarded are as follows: 1st, Meccano products value £2/2/–; 2nd, Products value £1/1/–; 3rd, Products value 10/6. There will be also ten prizes of Products value 5/–.

Entries should be written on one side of the paper only, and on the reverse side must appear the competitor's name, age and address.

Envelopes containing entries must be addressed to Meccano "Short Story" Competition, Meccano Ltd., Binns Road, Liverpool 13, and must be posted in time to reach Liverpool before 31st July, 1936.



The "cricketer" and the model carpet sweeper shown here are good examples of the kind of models that are eligible for the "Simplicity" Competition.

Simplicity Model-Building Contest

In this Competition we are offering prizes to Meccano model-builders who succeed in constructing the most ingenious and realistic models with the smallest possible number of parts.

Competitors must not imagine that in entering this contest they are restricted to any specified number of parts. Any number or variety of parts may be used, but the prizes will be awarded to those who succeed in constructing the most ingenious models with the smallest number of parts without sacrificing a realistic appearance. This Contest is not for owners of small Outfits only, however, as in the construction of simple models and mechanisms it is possible to employ many Meccano accessories, such as Cranks, Gear Wheels and Couplings, that are not to be found in the smaller Outfits. Competitors may select any kind of subject for their models.

When the model is completed a good photograph or a drawing of it should be obtained. It is far better to send a clear drawing if the photographs are indistinct, or too small to enable the essential features of the model to be seen. Photographs or drawings need not be the competitor's own work, but the model itself must be entirely the result of his or her own unaided efforts.

More than one model may be entered in the Competition, but all entries from any single competitor must be sent under the same cover. No single competitor can win more than one prize; if two or more models are submitted they will be considered jointly.

Entries will be divided into two Sections: Section A, for competitors of all ages living in Great Britain; Section B, for competitors of all ages living Overseas.

The following prizes will be awarded in each Section for the most interesting models built with the smallest number of parts: 1st, Meccano Products value £3/3/–; 2nd, Products value £2/2/–; 3rd, Products value £1/1/–. There will be also five prizes of Products value 10/6, and five prizes of Products value 5/–.

No entry forms are needed, but each competitor must take special care to see that his or her name, address and age appear on the back of each sheet of paper or photograph submitted. Envelopes containing entries should be addressed "Simplicity" Contest, Meccano Ltd., Binns Road, Liverpool 13.

Closing dates: Section A, 30th May, 1936; Section B, 31st July, 1936.

Model-Building Competition Results

By Frank Hornby

"Winter" Contest (Home Section)

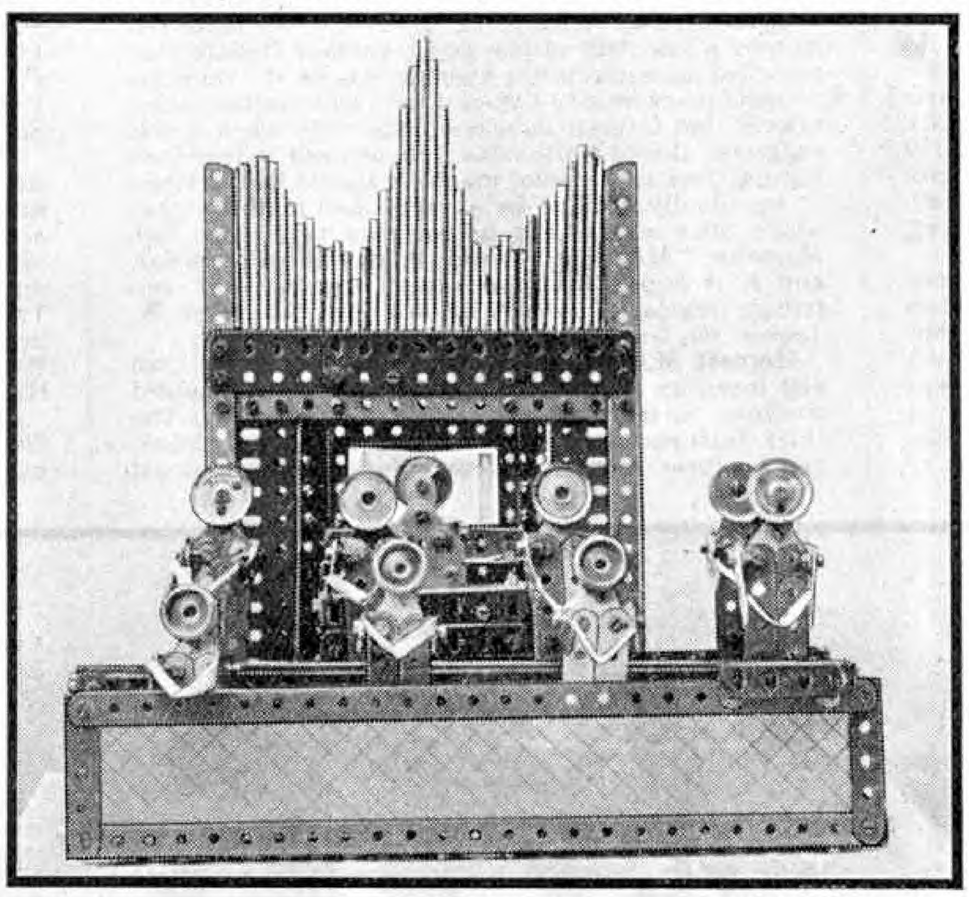
The results in Section A of the "Winter" Model-Building Competition are as follows:

1ST PRIZE, Cheque for £3/3/–: F. Higgs, Leicester. 2ND, Cheque for £2/2/–: G. Clarke, Coton, Cambs. 3RD, Meccano Products value £1/1/–: C. Edyvane, Westhoughton.

Products value 10/6: D. Cashmore and J. Harley-Mason, Ruislip; J. Matthews, Fillongley, Nr. Coventry; R. Walford, Newton Abbot; D. Middleton, Northampton; L. Tucker, Reigate; F. Hilten, Cowes, I.O.W.

Products value 5/–: J. Sheldon, Smethwick; D. Brooks, Alveston, Nr. Bristol; J. Maskell, Leigh; T. Pearson, Burnley; R. Emdon, Plymouth; J. Cooley, Wisbech.

F. Higgs secured First Prize with a working model of a 6-ton mobile crane, operated by a high-voltage electric motor of the type used in Meccano demonstration models. The motor drives a special gear-box by means of which the power can be directed to any of the movements of the model. An ingenious mechanism also is fitted for releasing the brakes on the hoisting and luffing drums when the various movements are engaged. As the motor has an ample power output, the crane is able to lift considerable loads, and for this reason every part of the crane itself and of the chassis had to be sturdily built. Besides operating the crane the electric motor also drives the road wheels, and propels the model along the ground at a good speed.



This model is entitled "The Village Choir" and won First Prize in the "Meccanitian" Contest for G. Hudson, Doncaster.

The model illustrated at the foot of this page won Second Prize. It is a reproduction of a reaper-binder that cuts wheat, oats or barley, and binds it into sheaves. It was built by G. Clarke, and performs all the operations of the actual machine, a fact that testifies to the mechanical knowledge and model-building skill of its builder.

A console organ is the subject of the model submitted by C. R. Edyvane, who was awarded Third Prize. The organ is simply constructed and is only 5 in. high and 5½ in. long. With the exception of the keyboard or manuals, which consist of white cardboard marked with ink, it is made entirely from Meccano parts.

Among the winners of Products value 10/6 is a splendid model of a modern gas cooking range. The new Strip Plates play an important part in the construction of this model, which owes its neat appearance to their use. Ordinary Meccano Plates also are used, and the gas pipes are represented by Crank Handles and Rods, which are so skilfully arranged that it has not been necessary to bend any of them. The realistic appearance of the model is largely due to the use of Springs and Pawls to form burners and taps respectively and the skilful manner in which they are incorporated in the structure. The model was built by D. Middleton.

A model of a full-rigged ship was sent by L. Tucker. The hull is made from Braced Girders, and the superstructure from Flat Girders and Plates. Rods are used for the mast and yards, and Meccano Cord for the standing and running rigging. If a little more care had been taken to secure a neat appearance, this model probably would have won a more valuable prize.

F. R. Hilten's model is a rather unusual type of bridge. It has no fixed piers, but floats entirely on the water, and is in the form of a rectangular pontoon on which are provided living quarters for the attendants, and compartments for the driving machinery. Along the centre of the pontoon is an aisle for the traffic, and at each end is a moving leaf that can be raised or lowered by means of cords. The model is about 45 in. long and 15 in. wide.

A deep sea diving suit provided T. Pearson with the idea for his model. It consists of four 2 in. Dunlop Tyres, above which are two Boiler Ends provided with a Chimney Adaptor to represent the window. On top of the upper Boiler End is a Pulley Wheel fitted with a Socket Coupling, and to this is attached a length of Sprocket Chain. Articulated arms are provided by means of Swivel Bearings and Worms, and the hands are made from End Bearings, the arms being secured to the model with the aid of ¾ in. Flanged Wheels. The legs are Sleeve Pieces pushed into ¾ in. Flanged Wheels, and are attached to the body of the suit by Rods that pass through the bosses of the Flanged Wheels and are provided at their lower ends with Couplings to form the feet. The ear pieces are Collars held on Bolts, and the air valve is a ½" Pulley.

"Meccanitian" Contest (Home Section)

The prizewinners in the Home Section of this Contest are as follows:

1ST PRIZE, value £3/3/–: G. Hudson, Doncaster.
2ND PRIZE, £2/2/–: B. Plucknett, Devizes.
3RD PRIZE, value £1/1/–: J. Robinson, Dunton Bassett.

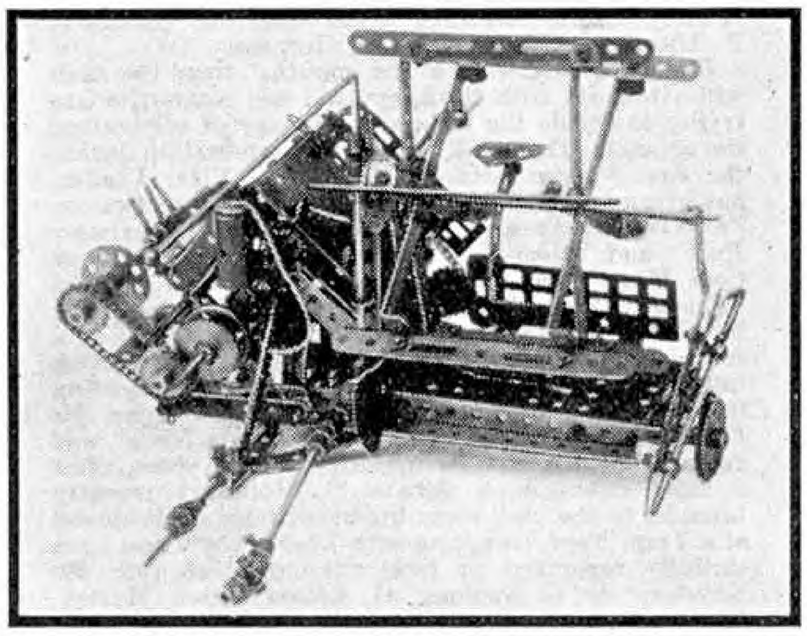
Meccano Products value 10/–: F. Saunders, Folkestone; K. Mardle, Carshalton-on-the-Hill; S. Wotherspoon, Liverpool; B. Wilde, Cuxton, Nr. Rochester; P. Wickham, Countesthorpe, Leicester.

Products value 5/–: J. Belasco, Edgware; J. Kennett, Richmond; J. Gerrard, Hardhillock by Drumoak, Kincardineshire; L. Slater, Portsmouth; G. Aspinall, Huddersfield.

"The Village Choir" is the title of the entry that won First Prize and is illustrated on this page. It was sent by G. Hudson, and is an interesting effort. Axle Rods are used to represent the organ pipes, and bolts with their heads enamelled white form the organ "stops." The figures of the choir are made up from Strips, and careful use of these has enabled the builder to obtain quite an amusing and realistic effect.

A tableau of five figures representing a group of carol singers was submitted by B. Plucknett and won Second Prize. This entry owes its success mainly to the care taken in arranging the figures in lifelike attitudes.

Third Prize was awarded to J. Robinson for a group of figures representing winter sports in the Alps, and composed of a man on skis, another skating and a third riding on a toboggan. The artistic manner in which the figures are arranged undoubtedly contributed to its success in this contest.



A good model of a reaper and binder built by G. Clarke, Coton, Cambs., that was awarded Second Prize in the "Winter" Contest.

November "Outfits" Model-Building Contest

Section A (Competitors over 12)

1ST PRIZE, Meccano Products value £2/2/–: A. Cole, Salisbury. 2ND, Products value £1/1/–: E. J. Stubley, Grantham. 3RD, Products value 15/–: J. Maguire, Belfast.

Section B (Competitors under 12)

1ST PRIZE, Meccano Products value £2/2/–: T. Dewsnape, Devizes. 2ND, Products value £1/1/–: D. H. Tomkinson, Wells Green, Nr. Crewe. 3RD, Products value 15/–: J. Capel, Chipping Norton.

Section C (Overseas competitors of all ages)

1ST PRIZE, Meccano Products value £2/2/–: Julian Tuteur, Toronto. 2ND, Products value £1/1/–: D. McLeod, Natal, S. Africa. 3RD, Products value 15/–: G. Hulley, Nantes, France.



Wednesbury and District M.C.—The club has been re-organised, and local schoolmasters are giving their support to it and advising their boys to join. Interesting reports in the local press of the club's activities also are helping to attract new members. Three meetings are held each week, and are well attended. The club-room has been equipped with benches suitable for Meccano model building and Fretwork, and electric light has been installed. Meccano Outfits and Clockwork Motors have been generously given by Mr. N. C. Till and Mr. J. Eccles. A Lantern Lecture on "*British Railway Engines*" was much appreciated. Club roll: 25. *Secretary:* A. L. Morgan, 17, Cobden Street, Fallings Heath, Wednesbury.

Pennthorpe School M.C.—There has been considerable model-building activity, some members working individually and others joining in the construction of a large motor chassis, each part of which was built by a separate group. The motor chassis was completed in time for the Exhibition at the end of the school term. The Headmaster of the School has given an interesting lecture on "*The Building of Railway Engines.*" Club roll: 25. *Secretary:* J. G. Slater, Pennthorpe School, Mead Road, Chislehurst, Kent.

Sutton Valence Council School M.C.—A recent model-building meeting was devoted to a Household Competition, in which those taking part had to build models of useful things for the home. The novelty of the Contest made it very popular, and the models constructed revealed ingenious uses of Meccano parts. A model Battleship Competition is to be held, and two prizes have been kindly given for this by Miss Agnew, Vice-President. Miss Agnew also has presented a picture of R.M.S. "*Queen Mary,*" and this now hangs above the Guild Certificate. Club roll: 23. *Secretary:* J. Chandler, "Herriard," Chart Sutton, Maidstone, Kent.

Burnley Grammar School M.C.—A novel Model-building Competition required competitors to build original models small enough to fit into a match-box. This gave rise to hard thinking, but those taking part rose to the occasion nobly. At another meeting members built in Meccano a complete model railway layout. Club roll: 22. *Secretary:* J. S. Keighley, Meccano Club, The Grammar School, Burnley.

Islington M.C.—The club's first Exhibition was a great success, and the splendid display of models was highly praised by the many visitors and in the local press. Recently talks have included one on "*The Lure of the Footplate,*" by Mr. V. Miller, Leader, and "*The Magic of the Circus Ring*" by the Assistant Leader. A visit was paid to an Exhibition arranged by the New Southgate H.R.C. Branch. Club roll: 14. *Secretary:* K. Dines, 70, Thornhill Road, London, N.1.

Sid Vale M.C.—The second Winter Session was notable for the large number of excellent models built. Frequent Model-building Competitions accounted largely for this, and the many different subjects gave plenty of variety to the programme. A Searchlight Contest produced several outstanding models, and was followed by a searchlight display that greatly interested all present. Many models of shop window electric signs advertising Meccano, Hornby Trains or Dinky Toys, were entered in an Electric Sign Competition. At a meeting given over to Hornby train operations, Mr. Foyle, President, gave the members a shunting test and set them several interesting railway problems, the working out of which on the club layout proved very fascinating. An illuminated Carnival attracted many visitors. Club roll: 20. *Secretary:* L. R. J. Gliddon, Sheffield House, Sidmouth.

St. Oswald's (Norbury) M.C.—Model building has been the chief activity. A Leader is urgently required, and the secretary would be glad to hear of any gentleman in the district who is interested in the club and would take over this office. Club roll: 15. *Secretary:* R. H. Smart, 14, Kensington Avenue, Thornton Heath.

Old Charlton M.C.—A Model building Competition in which Bridges had to be built from a limited number of parts was greatly enjoyed. Debates maintain their popularity, and a new departure in this line was a three-cornered Debate. In this the motion that "*Pedestrians have the prior right to the road*" was vigorously opposed by cyclists and motorists, and after a very interesting verbal tussle it was lost, the motorists gaining a majority of one vote. Another Debate that provided an entertaining evening was on the question "*Should white mice be kept as pets?*" This started rather tamely, but interest increased, especially when it was suggested that if white mice were allowed to live their natural lives in freedom, mankind should live in trees! It was finally decided by a very small majority that white mice should not be kept as pets. The club Magazine, "*Meccanic,*" is proving increasingly popular, and it is hoped that soon every member will contribute regularly to it. Club roll: 20. *Secretary:* W. Jaques, 60, Gurdon Road, London, S.E.7.

Hornsea M.C.—This club has now held more than 400 meetings, and the varied programmes provided continue to hold the interest of the members. The chief features are games evenings, Cinema Shows, and Lectures on many different topics, and occasional



Senior members of the Ashburton and Christchurch Meccano clubs "snapped" during a recent joint outing when enjoying a rest on the breakwater at Timaru, New Zealand. The two Ashburton members are on the left of the photograph. The three Christchurch members include Mr. J. Ancall, Leader, who is standing in the front.

Hornby Train meetings. Club roll: 12. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Plymouth M.C.—In a few months' time the club will attain its 10th birthday, and the committee are trying to decide the most suitable way of celebrating the occasion. There will be a further celebration during the first Winter session. Mr. W. J. Ellis, Leader, has given interesting talks to the Hornby section on "*Making Inexpensive Accessories from Newspaper Pulp*" and "*How to Make a Lineside Model Tin or Coal Mine,*" and has lectured to the whole club on "*Fourteen Years Watching Railways.*" Following this Mr. H. Shapcote, M.A., President, who has been a railway enthusiast 70 years, gave a very interesting talk on "*The Earliest G.W.R. Engines.*" At one meeting the motion "*This house is of the opinion that an Air Force is of more use to this Country than a Navy*" was defeated by the narrow majority of two votes, after a most entertaining debate. S. Holloway recently brought to the club-room his beautifully made model of a Tram Shed, complete with Dinky Toy Tram Cars skilfully repainted in local colours. Club roll: 69. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

Whitgift School M.C.—The club has been busy planning and building models for an Exhibition. One member has declared his intention of constructing a model road, and as all efforts to find out how he is going to do it have failed, his progress will be watched with great interest! Club roll: 53. *Secretary:* J. A. Watson, 23, Addiscombe Avenue, E. Croydon.

St. Stephens (Saltash) M.C.—Models recently built by the members have included bridges, aeroplanes, ships and motor cars. The time allowed for the construction of each type of model was two hours, and this has been found sufficient to enable some excellent models to be produced. At the Aeroplane model-building meeting a low wing monoplane was considered the best produced, and an oil tanker was the best of the model ships. The last hour of each meeting is spent in games. The Woodwork section have completed the cabinets in which to store the club stock of Meccano Parts, etc., and are now at work on a 7 ft. model of Plymouth (Millbay) Terminus. Two members of Plymouth M.C. attended one meeting as guests. A large Exhibition is to be held this Spring. Club roll: 17. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Mallow M.C.—The sugar beet factory model mentioned in previous reports of this club has been dismantled, and there is at present a lull in Model-building activities. A shunter employed at the factory recently visited the club and gave an interesting talk on his duties, demonstrating them by means of Hornby Trains. A Stamp section has been formed, and an introductory talk on the hobby has been given by Mr. W. J. Roche, Leader. Club roll: 12. *Secretary:* D. Hickey, 42, Ballydaheen, Mallow.

Claremont Avenue School M.C.—An interesting diversion has been the making of Jig-Saw Puzzles. Most meetings are concluded with a brief period of games. Model-building continues to be very popular, and a new member recently completed fine models of a lathe and a motor chassis. Many different types of models have been built in preparation for an interesting club Exhibition. Club roll: 13. *Secretary:* G. Turton, 5, Brookfield Crescent, Kenton.

CANADA

Montreal Central Y.M.C.A. M.C.—Model-building is the main feature of the meetings, and each week shows an improvement in the skill of those taking part. Several of the models recently built have incorporated a Meccano Steam Engine, a "Magic" Clockwork Motor, or a No. 2 Clockwork Motor. Arrangements have been made for visits to local factories, a picnic on Mount Royal, and a Lantern Lecture dealing with "*The Great War.*" Club roll: 9. *Leader:* Mr. J. Rodrigues, 1900, Tuppet Street, Apartment 4, Montreal, P.Q., Canada.

Strathcona M.C.—Talks are very popular, and subjects discussed have included "*Cranes*" and "*Bridges.*" Efforts are being made to increase the membership. Club roll: 6. *Leader:* Mr. M. Stanley, 9715, 83 Avenue, Alberta.

EGYPT

Cairo M.C.—Several new members have been enrolled. A fine display of models was staged by the club at the recent Agricultural Exhibition at Cairo, and proved a great attraction to the many hundreds of visitors. The Exhibition was open from 7 a.m. until 7 p.m. *Leader:* Mr. Mohamed F. Awad, 7, Atfet El Zamia Haret El Gameh, Cairo.

NEW ZEALAND

Ashburton M.C.—A very successful Parents' Evening marked the end of the financial year of the club, and the large attendance included many members of the Christchurch M.C. and their friends. There was a splendid display of models, and prizes were awarded for the best exhibits. An excellent concert was presented chiefly by members of the club and Merit Medallions and other awards won during the year were then presented. The evening concluded with supper and games. A large Hornby layout was provided for the amusement of children present who were too young to take part in the games. The senior members, accompanied by parents and by several visitors from the Christchurch M.C., recently made an excursion to Hakatere Beach. Club roll: 31. *Secretary:* Miss C. E. Furniss, 176, Burnett Street, Ashburton, New Zealand.

SOUTH AFRICA

Berea M.C.—Meetings are well attended and members take part keenly in the various club activities. Recent outdoor events have included an exciting paper chase. Visits to several factories in the district are being arranged. Club roll: 20. *Secretary:* L. Michelow, 74, Hillbrow Street, Berea, Johannesburg.



Visits to Places of Interest

During the Summer sessions most Meccano clubs take every opportunity of paying visits to places in which their members are interested, such as gas works, electric power stations, engineering works, factories, docks, fire stations, and tramway and bus headquarters. In many clubs outings of this kind have become a regular feature of the Summer programme that is greatly appreciated by members, and the Leaders of new clubs should spare no effort to follow this example.

Generally there is little difficulty in making the necessary arrangements, for the officials of the undertakings concerned usually are glad to welcome a well-organised and well-behaved party of Meccano boys. It is very necessary to treat such visits seriously, and to make courteous application by letter two or three weeks beforehand. The number of members who will form the party should be mentioned, and the day and time on which it would be most convenient to come should be stated, although this of course is subject to modification if required. An assurance should also be given that the whole party, down to the youngest member, will be "on their best behaviour." Visits of this kind are a very great privilege, and the members taking part should bear in mind that any mishap or unpleasant incident may spoil the chance of other would-be visitors.

At the conclusion of the visit the Leader should thank the guide, and another point that should never be forgotten is the necessity for writing later to the officials concerned in appreciation of their courtesy.

Providing Funds for Outings

The number of visits to places of interest that can be made is generally limited by financial considerations. It is obvious that the cost of the outings cannot be met by club funds, as although the cost per member is small, the total amount in the case of a fairly large party is considerable. On the other hand individual members often find, on the date of the visit, that they cannot participate because they are unable to pay their share of the expenses. There are usually a few generous and more prosperous members who will offer to subsidise the unfortunate ones, but such action, however well-meant, is not a fair and satisfactory solution of the problem.

A little forethought and systematic preparation will ensure that all who wish to do so shall take part in the outings. One way in which this is achieved in many clubs is by running a savings bank purely for the purpose of accumulating funds to finance outings. Each member pays in at regular intervals a small sum, it may be only a copper or two, and this money, gradually increasing, soon becomes sufficient to meet the expenses of the various visits decided upon. When the time for a particular visit arrives, each member is able, if he so wishes, to draw from the bank sufficient money to pay his share of the cost of the outing, and in this manner quite a number of visits may be carried out without any difficulty on the ground of cost.

Meccano Club Secretaries

No. 36. M. F. M. Awad



M. F. M. Awad is secretary of the Cairo M.C. This Egyptian club was affiliated in January 1935, and its steady progress has been largely due to his enthusiasm and energy. Meetings are held almost every night, and are frequently attended by interested visitors.

Recent Successful Exhibitions

Reports of successful club Exhibitions, held either independently or in connection with some local bazaar or fixture during the winter sessions of 1935–36, have reached me from many quarters. It is evident that the value of a good Exhibition as a means of attracting new members and of making known the worth-while character of the Meccano hobby is being increasingly recognised by Leaders. In the early days of the Guild movement many Leaders were of the opinion that the organisation of an Exhibition was beyond the powers of all but the strongest clubs, but displays of high quality are now arranged by practically all clubs, and invariably arouse great interest.

One reason for the fascination exercised by these Exhibitions is that they are no longer haphazard arrays of models of all types and sizes, arranged on tables without regard to order or suitability. The models displayed still reflect the individual taste of members, but follow a definite plan, and every member does his best to ensure that the scheme adopted is effectively worked out. The most successful Exhibitions appear to have been those that included a well planned Hornby layout, on which fascinating operations were carried out. This is natural, for just as a successful shopkeeper takes care that his windows are arranged so as to attract and hold the attention of passers-by, so must a club display be provided with some feature that immediately draws attention, and thus leads visitors to examine carefully the more serious items that they would otherwise be liable to miss.

Several of the Exhibitions held by Meccano clubs during last session were commented upon very favourably in the local press. For instance, the joint Exhibition given by the Islington M.C. and H.R.C. Branch was reported as showing "the amazing variety of the boys' interests. Not only had they constructed ingenious Meccano models of buses, lorries and travelling cranes, but with infinite patience had constructed a complete aerodrome, perfect in every detail, and a model railway with excellent working trains and beautifully constructed stations."

South African Clubs' Fine Display

Occasionally an opportunity arises for clubs to participate in important exhibitions organised by outside bodies. Last Winter the Malvern and Berea clubs, of South Africa, staged a very fine Meccano and Hornby display at the Modern Radio and Engineering Exhibition organised by "*The Star*," a Johannesburg newspaper, and held in the Town Hall of that city.

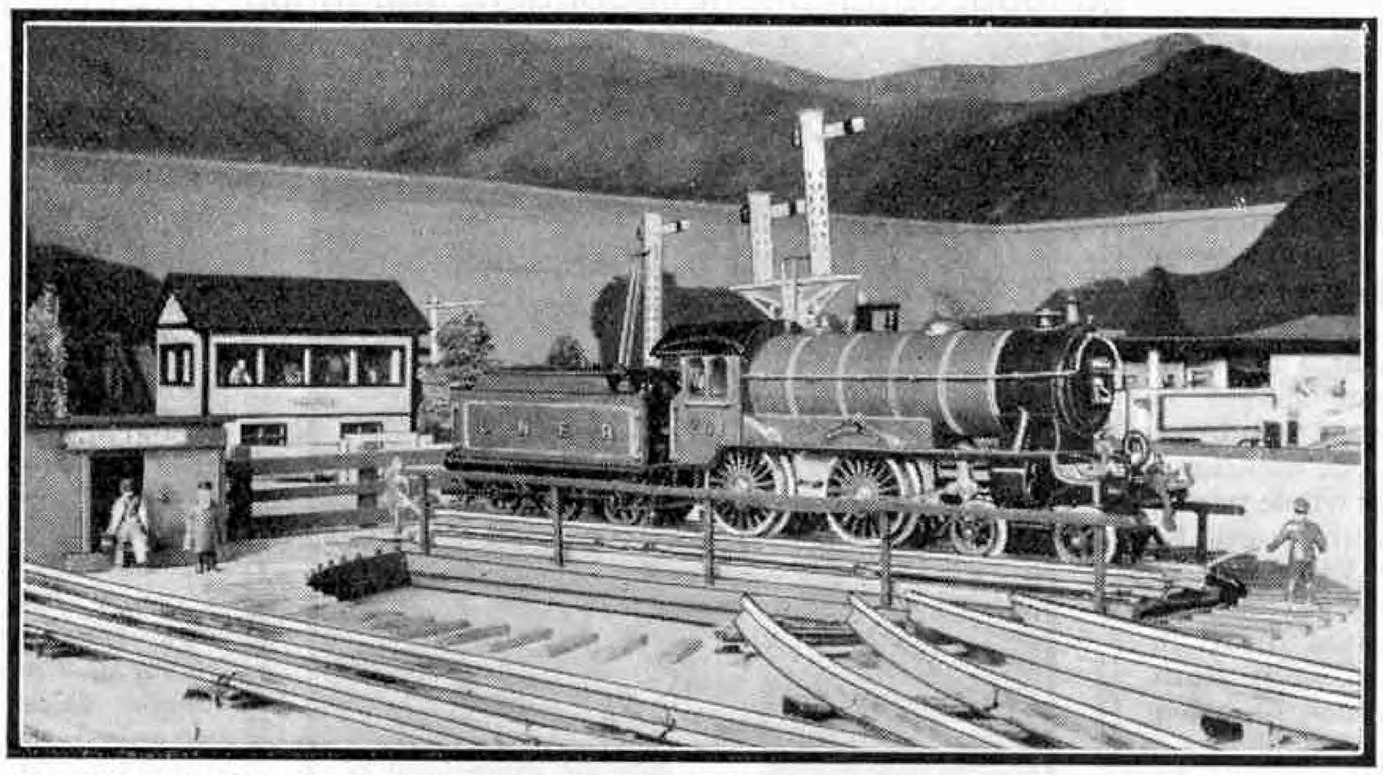
"*The Star*" commented that "the clubs' exhibit exercises enormous fascination for the thousands of children who flock daily to the Town Hall. Rarely is there a moment when the room is not filled by crowds of young enthusiasts watching the little train dodging in and out of tunnels, or the gas works model hauling up its trucks. The making of these models took nearly three months."

A Realistic Layout in Canada

Notes on Some Recent Improvements

CONSTANT developments are in progress on real railways to enable traffic to be handled more easily. Stations are rebuilt, new signalling installations are brought into use, new lines are put down, and junction and yard layouts are improved. In miniature also improvements and additions are always possible, and this is one of the greatest charms of the model railway hobby. We frequently receive from readers, both at home and abroad, details of the latest developments on their systems, and such information is always interesting, particularly when it is accompanied by a photograph showing the most recent state of affairs on their miniature railways.

It will be remembered that in July 1935 we published details of an interesting L.M.S.R. system in Victoria, B.C., operated by Mr. H. G. Ogden and his son. Since that time extensive additions have been made to the equipment, and the system generally has been developed to a greater pitch of realism and efficiency than before. A double line of rails is now provided throughout the main line circuit, with the result that express traffic has been increased, and this can be handled more easily than the former services. At the same time a branch line within the main circuit has been laid down, and this serves the country station of "Millbank." Actually the branch is a continuous loop for convenience in operating, and at times forms a useful alternative for heavy traffic on the main line.



Part of the extension of the layout of Mr. H. G. Ogden of Victoria, B.C., as described on this page. This photograph shows the turntable, store building and part of the new sidings, and the scene is effectively completed by the painted background.

At one corner of the system the baseboard has been extended to make room for sidings for coaching stock and for an additional engine shed. A new turntable forms the means of access to the shed, saving space by making points unnecessary. The construction and installation of the turntable was an interesting process, as the table is of the deck type and revolves in a proper pit. The pit was arranged by cutting a circular hole in the baseboard and fitting below it a sub-base to support the table and to form the bottom of the pit. The turntable itself is of wood and revolves on a steel spindle that turns in a metal centre-bearing. Its ends are supported on small wheels that bear on the pit bottom and give very smooth working. Light railings finish off the sides of the table, and there are push-bars for the use of the enginemen turning the table. The edge of the pit is provided with radiating battens, as in actual practice, to afford a foothold for the men. The turntable is 15 in. long and will accommodate a large 4–4–0 locomotive and tender together.

Among further improvements is the provision of a coaling plant near the original engine shed. This is of simple construction, but it can be operated in a satisfactory and realistic manner. There is a raised stage underneath which the "loco coal" wagons stand. On the stage is mounted a revolving derrick that lowers a tub or skip to the wagons. When filled the skip is hoisted, the derrick revolves through a quarter of a circle, and the skip is then lowered and emptied into a chute that is placed at a convenient height to discharge into the tender or bunker of a locomotive standing alongside the stage.

Scenic effects also have received attention. The improvement that has resulted from the addition of an attractive background is brought out in a striking manner if the illustration on this page is compared with those that accompanied the original description in the "*M.M.*" for July 1935. To provide some variation in the lineside features, and to fill up a corner in an effective manner, a tunnel has been introduced on the main line near to the points where the branch line diverges. Its use there helps the impression of the complete separation of the branch from the main line as the latter disappears into the black bore of the tunnel. The latter is driven through a "ridge" that leads up to the "higher country" featured on the scenic background. The tunnel fabric was constructed in the manner frequently advised in these pages, brown paper well soaked in paste being laid over a previously prepared wooden framework of irregular shape. The "covering" of the tunnel is painted to harmonise with the scenic background and the bore is finished at each end with appropriate tunnel mouths. Minor but effective details are the boards at each end that give details of the length of the tunnel.

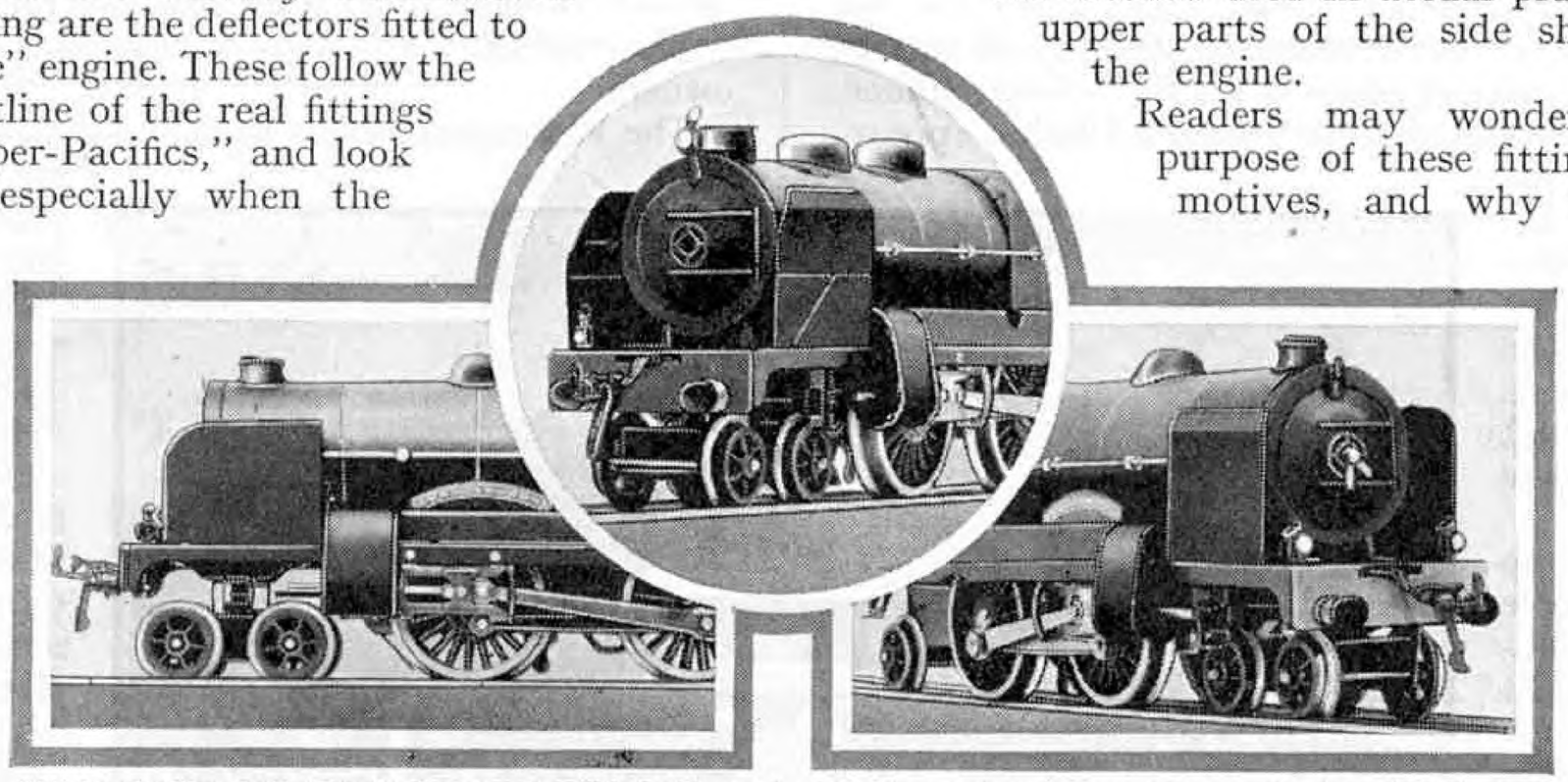
Additions have been made to the stock in the shape of Hornby No. 2 Coaches in L.M.S.R. colours. Two first-thirds and a brake-third make up an effective local train, and they are hauled as a rule by the No. 1 Special or No. 2 Special Tank Locomotives that were already in service. As the main station is named "Carlisle" it was decided to introduce representative L.N.E.R. stock also. Therefore a No. 2 Special Tender Locomotive of that company is now in use. This is "*The Bramham Moor*" of the latest "Hunt" class, which is very appropriate in view of the inclusion in the countryside of miniature hunt figures.

Smoke Deflectors for Hornby Locomotives

By "Tommy Dodd"

THIS month I have to deal with some interesting fittings that have recently become standard for those Locomotives of the Hornby Series on which their use is appropriate. These fittings are the smoke-deflecting side sheets that are provided at the front end of the Nord Riviera "Blue," L.M.S.R. "*Royal Scot*," and S.R. "*Lord Nelson*" Locomotives of the E320, E36 and No. 3C types. These up-to-date additions increase considerably the realistic effect of these engines and improve their massive appearance, as the accompanying illustration shows. Although the purpose of the real deflectors is the same in each case, there are some interesting differences in their design on the Nord, L.M.S.R. and S.R. systems; and these differences are reproduced as far as possible in the dummy deflectors fitted to the Hornby Locomotives.

The most striking are the deflectors fitted to the Riviera "Blue" engine. These follow the characteristic outline of the real fittings of the Nord "Super-Pacifics," and look very imposing, especially when the engine with its plain "stove-pipe" chimney is viewed head-on. The lower portion of each deflector is set out at an angle from the locomotive so that each side sheet overhangs the edge of the footplating. Then a slight bend brings the centre portion of the deflector upright; and above this the upper edge of each sheet is abruptly turned inward. The leading edge of this turned-in portion is cut away at an angle and this cutting-away continues partly down the vertical surface of each deflector. The two deflectors, one on each side of the smoke-box, thus have something of the appearance of a deep "scoop" in the centre of which is the smoke-box and chimney.



This illustration shows Hornby Locomotives fitted with smoke deflectors as described on this page. On the left is the S.R. "Lord Nelson," in the centre is the Nord Riviera "Blue" Locomotive, and on the right is the L.M.S.R. "Royal Scot."

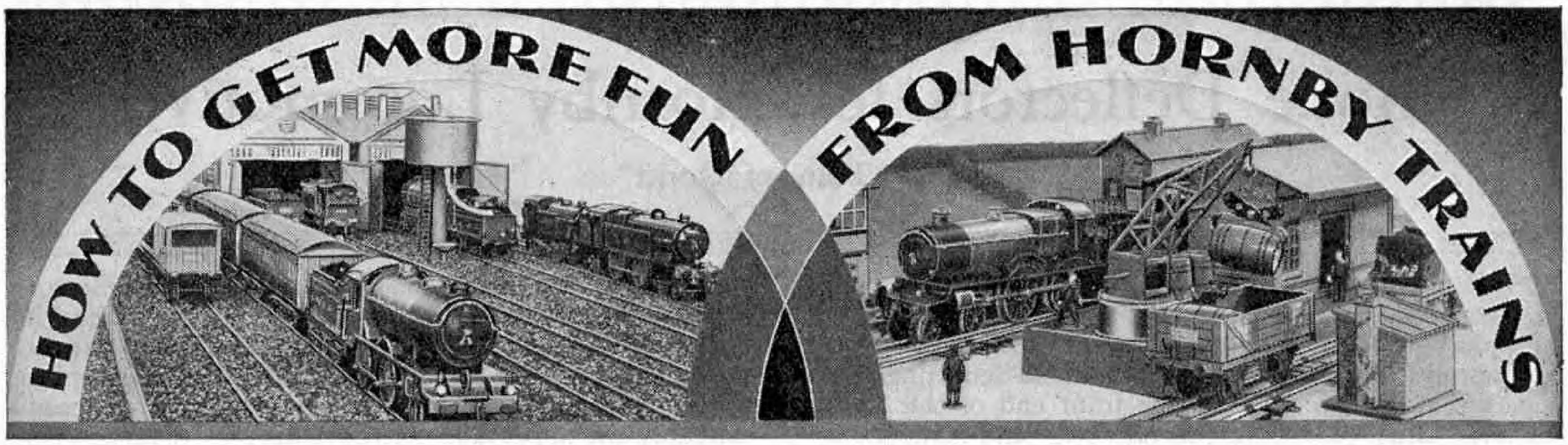
The deflectors fitted to the English type engines are less elaborate in their style. Those on the "*Royal Scot*" model extend from the footplating vertically upward to a point approximately level with the upper hinge bar on the smoke-box door. There they turn fairly sharply inward. The forward edge of the turned-in part is rounded off, and helps to give the deflectors a better appearance than they would have if the vertical and horizontal edge had continued to a plain square corner at the front end.

The deflectors fitted to the S.R. "*Lord Nelson*" are even less elaborate. They extend vertically upward to the limit of their height, and the front top edge is well rounded off to a greater curve than that of the "*Royal Scot*" fittings. In their simplicity of type and outline they follow the deflectors fitted to the real "Nelson" engines, which are different from those in-sloping "blinkers," as the enginemen often call them, that are fitted to the "King Arthurs."

Although they differ in their actual shape, the deflectors fitted to these three Hornby Locomotives are alike in that each type has embossed edges. This feature adds to their strength in the same manner as the beading applied to the real ones. The embossing also improves considerably the appearance of the deflectors, making them look more "finished." All three types are alike in the manner of their fitting to the engine. The bottom edges of the deflectors have lugs that fit into slots provided in the footplating. In addition, to secure them in the correct position each deflector sheet has a small angle bracket formed at the rear edge, and through a hole in this bracket the handrail alongside the boiler passes. This attachment to the handrail resembles closely the method used in actual practice to stay the upper parts of the side sheets securely to the engine.

Readers may wonder what is the purpose of these fittings on real locomotives, and why they have only come into use during the last 10 years or so. They have become necessary as the result of the progress of locomotive design and the increased efficiency of the latest types. With modern locomotives capable of running on very short cut-offs, the exhaust pressure is low and there is a tendency for the steam from the chimney to drift along the boiler top and obscure the driver's look-out. The trouble is accentuated by the very low boiler mountings that are necessary on account of the large size of present-day locomotive boilers. The purpose of the deflectors is to cause an upward current of air in the neighbourhood of the chimney, and thus lift the exhaust steam and smoke well above the cab.

Some deflectors of the side sheet kind were first developed in Germany and are in fairly common use on the Continent. In this country the S.R. employ them for practically all their modern locomotives. They are employed on the L.M.S.R. only to a small extent; all the taper-boilered locomotives are without them. On the L.N.E.R. their use is confined to one or two locomotives and on the G.W.R. they are not in use at all. The tapered boiler in common use on the engines of that line, and on the latest L.M.S.R. engines, would seem to be of assistance in securing satisfactory deflection of the exhaust. The reduction of the boiler diameter at the front end enables a chimney of reasonable length to be mounted on the smoke-box, and this also helps to throw the exhaust well up, away from the driver's line of vision.

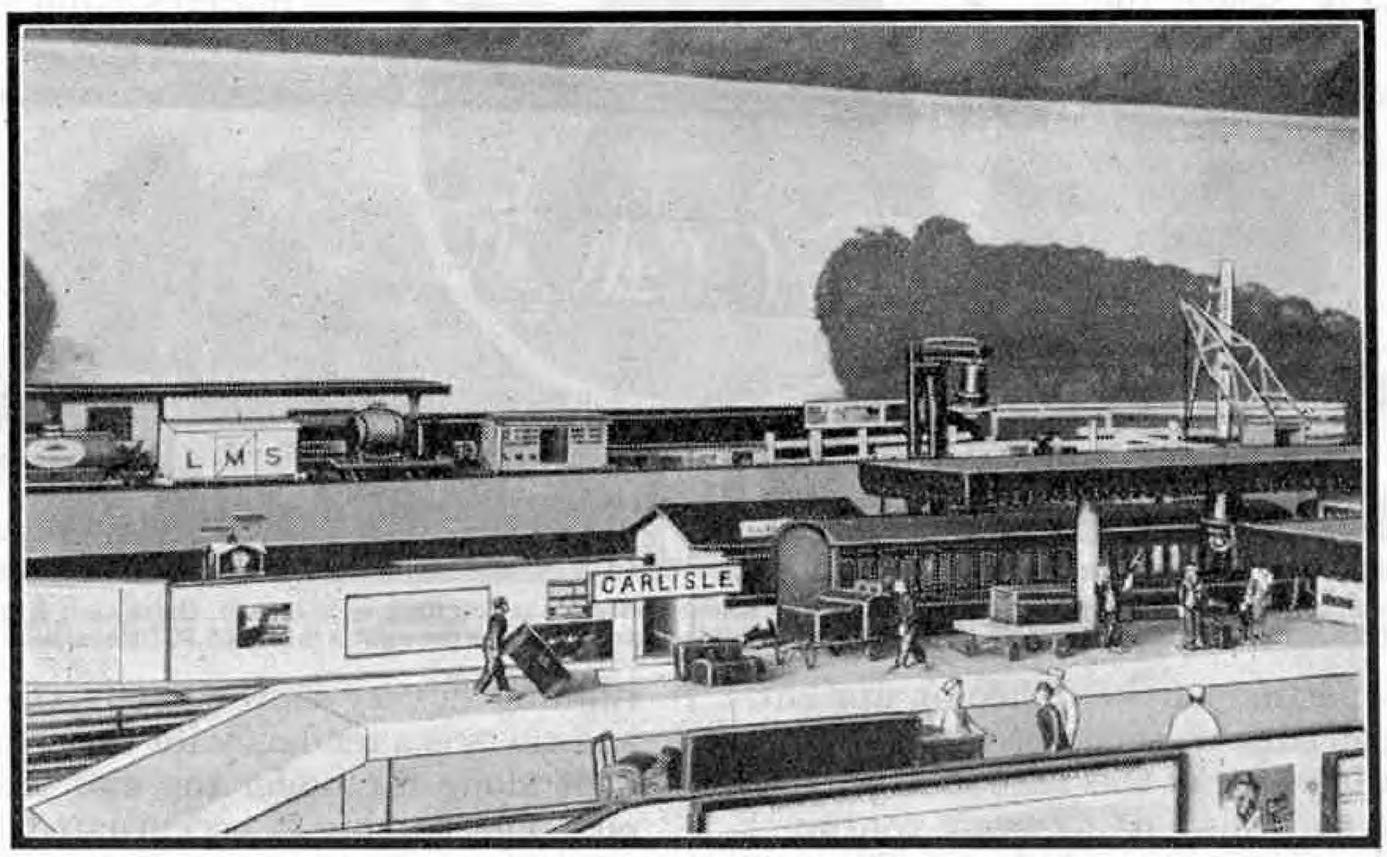


STATIONS AND THEIR EQUIPMENT

EVEN on the smallest Hornby Railway one station at least is a necessity; and on large systems several stations will be required so that the line may provide for the needs of the districts that it serves. A layout that has no station remains a mere desert track, for there is no place where the trains can deal with their passengers! The various Stations and Platforms in the Hornby range, and the station and halt of the M Series, enable miniature railway owners to provide their lines with stations in a satisfactory manner. But a mere Station on its own has a dull and lifeless appearance, quite unlike the busy aspect of the real thing. In this article therefore we shall consider the equipment of stations in such a way that they appear life-like and realistic.

Our first step should be to people the Station with railwaymen, and then with passengers. Otherwise there would be nobody to attend to the trains that arrive and nobody to use them! An appearance of bustle and activity is soon given by the addition of some of the Dinky Toy figures. Boys usually commence with one or other of the boxed sets; then as traffic develops and the business grows additions become necessary. Frequently more of one type of figure than another is required and it is a great convenience to be able to buy the individual items separately as they are wanted, rather than to have to obtain further complete sets. A flock of the Stationmasters for instance as contained in Dinky Toys Set No. 1 would be difficult to find work for; but the energetic Porter with bags, Dinky Toy No. 1E, and the ordinary Porter, Dinky Toy No. 1F, are always useful. The last-mentioned figure can be used for numerous purposes. This also applies to the Ticket Collector, Dinky Toy No. 1C, who, if he has his nippers removed, can be made to look as if he is handling milk cans or luggage and doing various other jobs, such as opening or closing carriage doors. A number of Engine Drivers, Dinky Toys No. 1D, will be necessary in and around the Engine Shed, but one can appear whenever a locomotive stands at the Station for any length of time. He can then be engaged in looking round his engine, as he has a big oil feeder in his hand. The Guard, Dinky Toy No. 1B, is a useful man also. In addition to his designed purpose he can be employed in other ways, especially if his flag is removed. He can then be used as an inspector, and with his hands raised he will appear as if urging the porters to attend to some job. Other uses for these figures will no doubt suggest themselves to ingenious Hornby Railway owners.

The Passengers can be used in any number and variety, not only on the actual Station platforms, but also in the "streets" nearby and anywhere else along the lineside where their use is appropriate, such as at Footbridges and Level Crossings. In using these figures care should be taken to place them so that they look as "natural" as possible. A party of Hikers, Dinky Toys Nos. 3C and 3D, is quite reasonable; but the other figures should be well mixed.



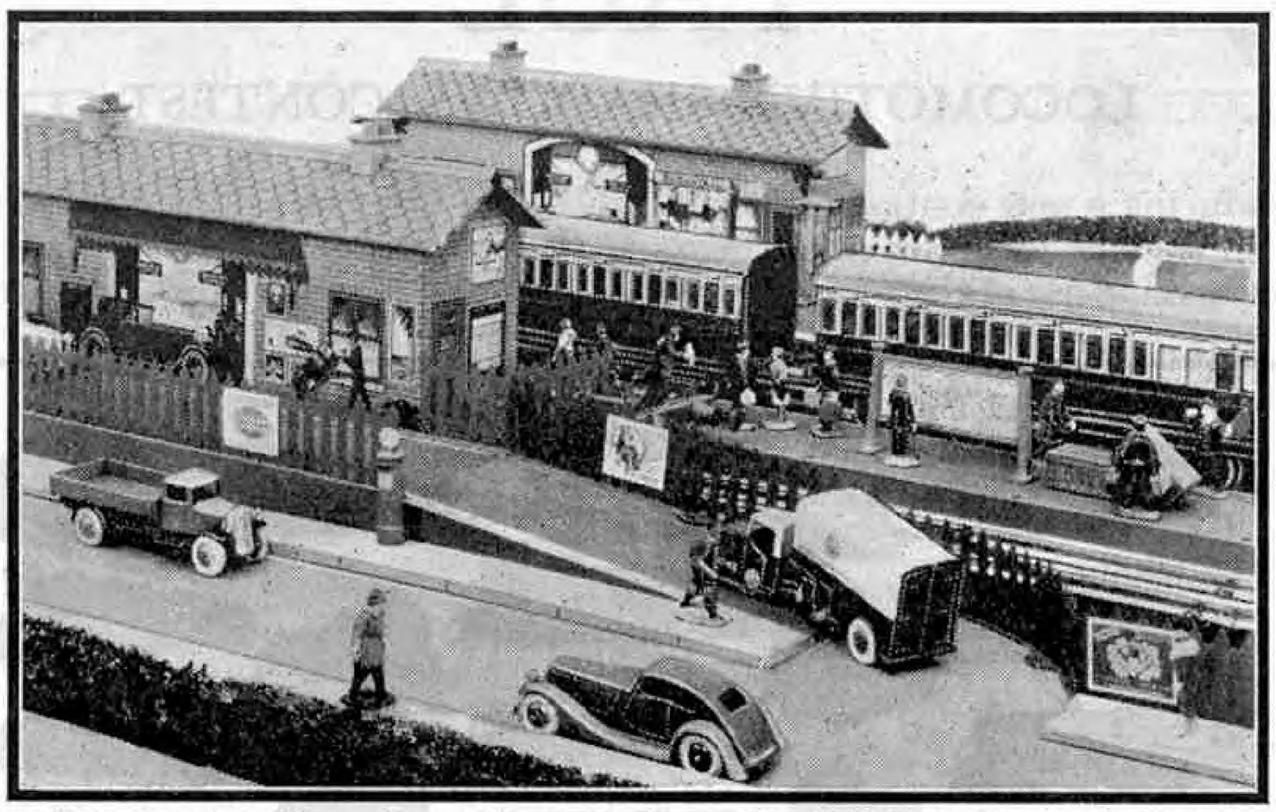
Part of the realistic miniature railway system operated by Mr. H. G. Ogden, Victoria, B.C. Special attention is devoted to details as is shown by the miniature figures, luggage, and other items on the station platform in the foreground.

The Train and Hotel Staff of Set No. 5 are specially suitable for use at the more important stations. "Hotel porters meet all trains" is a familiar announcement and it can be actually accomplished on a Hornby Railway with the aid of several of the figure No. 5C, which takes the form of a porter in striking livery and carrying a passenger's luggage. The white jackets of the train attendants show their calling. There are packed in each Set No. 5 two Pullman Car Waiters, Dinky Toys No. 5B, under the supervision of the Pullman Car Conductor, Dinky Toy No. 5A. They look well on the platform before the departure of a train if placed near the vestibule doors of the Pullman Cars. They will then appear to be assisting passengers to entrain, answering their questions and generally attending to their wants. Some boys make their Train Staff actually travel in the trains, securing them to the floors of Pullman Coaches by means of Seccotine or other adhesive. They look quite realistic thus when seen through the windows of a passing train.

We must not forget the Engineering Staff of Set No. 4.

These can be used very well at different points on the railway property, singly or in gangs.

With the Staff generally at work and with the Passengers presenting themselves in satisfactory numbers we must turn our attention to the various accessories that add to the characteristic appearance of station premises. There are the popular accessories that are available in Railway Accessories Sets Nos. 1, 2 and 3. These include pieces of luggage and a suitable porter's barrow in Set No. 1. Then there are the Milk Cans, whose clatter when empty, or their deeper rumble when full, is still a characteristic "railway noise." A four-wheeled trolley is provided for moving the cans and it is useful also for ordinary luggage. Set No. 3 includes two platform seats and there are two "penny-in-the-slot" machines. One is the familiar platform ticket machine and the other represents the nameplate-stamping machine of the type so popular with boys. The other item, a realistic pillar-box, is suitable for use on large stations or in the streets or roads in the neighbourhood of the line. A further Set of Railway Accessories—No. 9—contains some useful pieces. These are station nameboards which can be used very effectively.



An interesting view of the road approach to the Station on a Hornby Railway. The effective treatment of the surroundings is most important if the best results are to be obtained from the use of Stations.

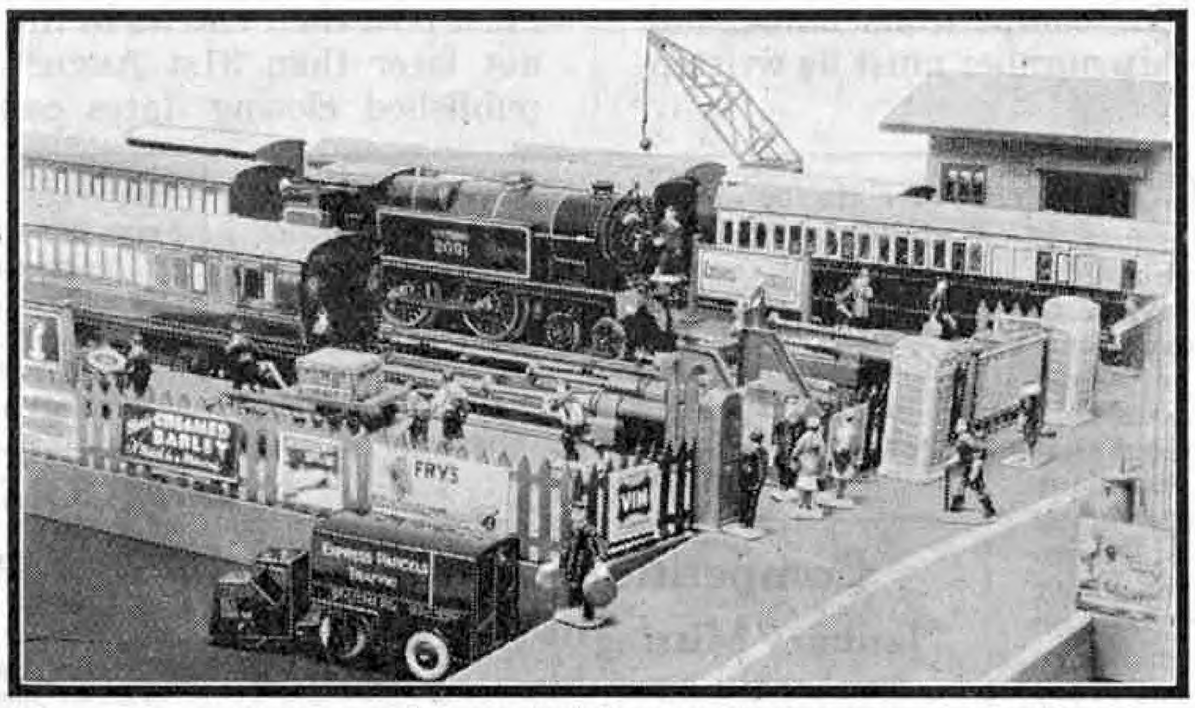
A new item in the Dinky Toys range is the Telephone Call Box, Dinky Toy No. 12C. One or two of these look very realistic if placed on the station platform or other convenient part of the railway premises.

With these we practically complete the actual equipment of the station. Even so a glance round will reveal a strange bareness on the buildings generally and on the fencing. Then we realise what is lacking; we have on exhibition none of the familiar posters and other announcements that are such a feature of stations and other premises in real practice. Fortunately we can soon remedy this by the use of the Miniature Posters of the Hornby Series. These reproduce most faithfully the national advertisements with which we are all familiar, that greet us from almost every hoarding and space where the enterprising billposter can place them. The Miniature Posters are available in two varieties known respectively as Series 1 and Series 2, and as they are printed in the colours of the originals their effect is very striking. To enable them to be attached readily to walls, etc., they have gummed backs.

As the direct attachment of the Posters to paled fencing, footbridges and other items of this kind would not be convenient or very effective, there are special Poster Boards that are made in two sizes. These are flat metal plates that have two hooked lugs formed on the top edge and this makes possible the attachment of the Boards to Paled Fencing, the lugs being hooked over the top bar of the fence. In addition of course they are easily removable, which is a great advantage. The Poster Boards are obtainable separately, and a sample of the smaller size is enclosed in each packet of Posters.

In addition to these Boards there is also the Station Hoarding that is specially adapted for poster display and for the attachment for any announcement regarding train services, excursions and special trips that the miniature railway company are operating. It is suitable for use on Station platforms, in the fields along the line and on the road-side. In addition to their use for posters and bills generally they can be used very satisfactorily as timetable boards. The timetable displayed can be cut out of a small pocket railway guide and attached to the hoarding with Seccotine.

Although a miniature Station is necessarily to be considered chiefly from the railway point of view, its arrangement in relation to its surroundings are not to be neglected. Thus as far as possible a reasonable means of approach for the passengers should be provided, although when space is restricted surrounding details may have to be supplied by a scenic background only. If space permits of it there is great scope for the realistic arrangement of the Station approach and its details.



A busy scene at a terminal station. Standard Passenger Platforms are used and the various Dinky Toys and Railway Accessories components give quite a realistic air to the scene.

Paled Fencing and Station Hoardings decorated with Miniature Posters are again very effective here. The standard Dinky Toys motor vehicles of all kinds can appear on the "roads," and an up-to-date feature will be the formation of a car parking space by the Station for the convenience of passengers and others. The establishment of a Petrol Station, Dinky Toy No. 48, with its battery of Petrol Pumps outside, Dinky Toys No. 49, will add to the general air of realism.

Then the road services of the railway company that are operated from the Station must not be forgotten. For these the Mechanical Horse and Trailer Van, Dinky Toy No. 33R, is specially suitable.

To regulate the road traffic the various Robots, Traffic Signals, Dinky Toys No. 47A, 47B, 47C can be made good use of in appropriate places, also the familiar Beacon No. 47D and the numerous Road Signs of Set No. 47. At important points the R.A.C. or A.A. Huts of Sets Nos. 43 and 44 can be placed with the appropriate Guides near by.

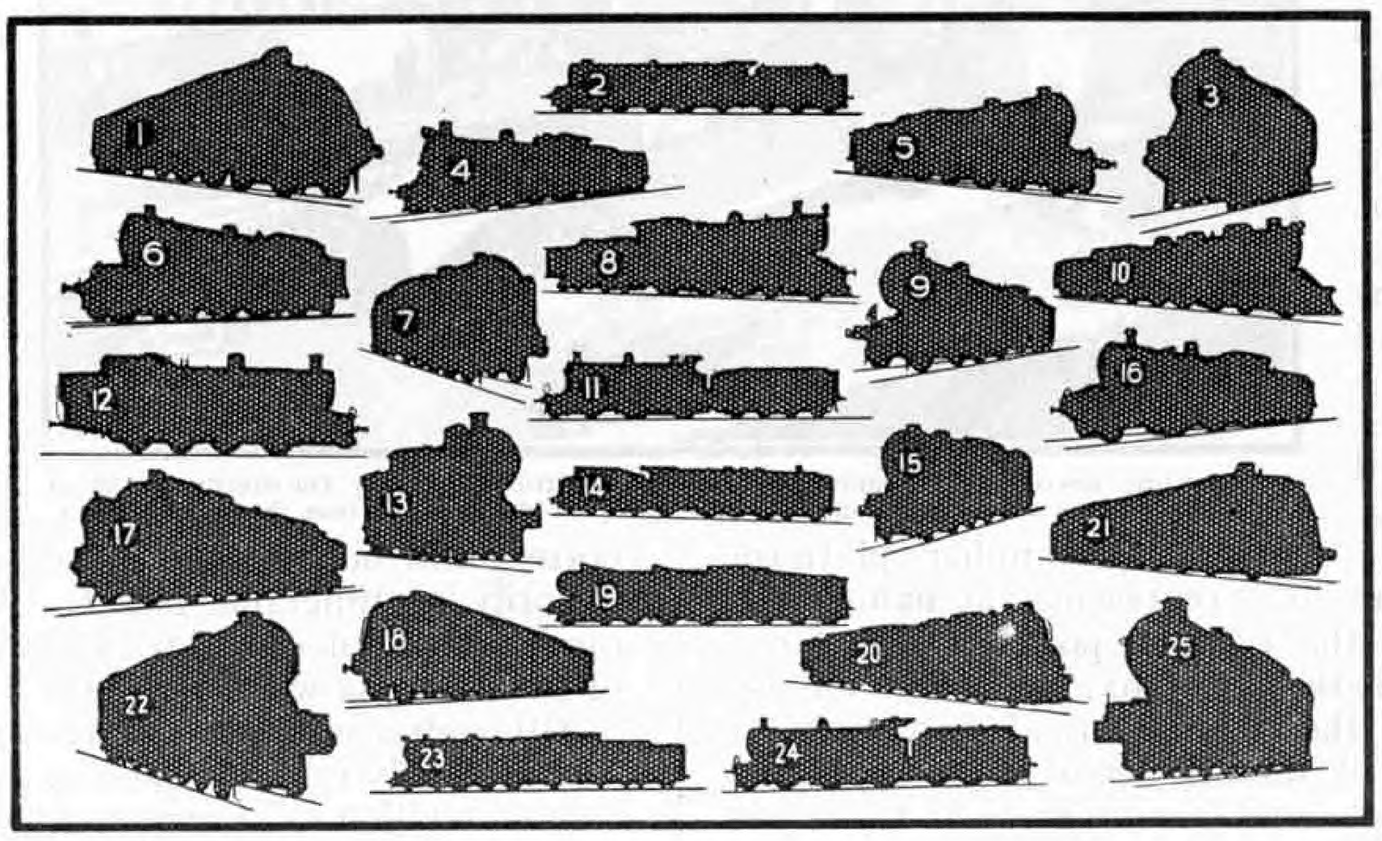
Join the Hornby Railway Company and become eligible for the competitions announced on this page.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

LOCOMOTIVE SHADOWS CONTEST

This month we are introducing a new contest that will be of exceptional interest to readers, for it provides them with a novel opportunity of making use of their knowledge of locomotives and their wheel arrangements. The accompanying illustration shows 25 locomotive shadows. Competitors are required to discover the identity of each one, and to state its class, its wheel arrangement and the railway company owning it. The shadows are not all of British locomotives, and among them are those of well-known locomotives of overseas countries, including Australia, Palestine, America, Germany, France, New Zealand and India.



When a competitor has identified all the locomotives, or as many of them as possible, he should make a neat list of them on a sheet of paper, together with the details in the order asked for above. The competitor's name, full address and H.R.C. membership number must be written on the back of his entry.

The Contest will be divided as usual into two Sections, Home and Overseas. Prizes of any products manufactured by Meccano Ltd., to the value of 21/–, 15/– and 10/6 respectively will be awarded to the three best entries submitted in each Section. In the event of a tie for any prize, neatness will be taken into consideration when the judges make their final decision. In addition a number of consolation prizes will be awarded to those members whose entries are not among the winners of the major prizes, but nevertheless deserve some reward.

Envelopes containing entries must be marked *"H.R.C. May Locomotive Shadows Contest"* in the top left-hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th May. Overseas competitors must post their entries in time for arrival at Headquarters not later than 31st August. Entries received after the published closing dates cannot be accepted.

Railway Photographic Contest

Last month we announced the first of the summer series of Photographic Contests, in which competitors were invited to submit photographs of any railway scene. This month we give details of the second contest of this series. As in previous contests, there are no restrictions, except that the actual exposure must have been made by the competitor himself; the developing and printing may be the work of a professional. Competitors may send as many different prints as they desire, but no competitor can win more than one prize in one contest. It is important that every print submitted should have on the back the name of the competitor, his full address and his H.R.C. membership number. A short description of the scene of the photograph must also be given. As mentioned in last month's issue, the best of the prize-winning entries will be filed for possible use in future issues of the *"M.M."*

The Contest will be divided as usual into two Sections, Home and Overseas, and prizes of any products manufactured by Meccano Ltd., or photographic material if desired, to the value of 21/–, 15/– and 10/6 respectively will be awarded to the senders of the three best entries submitted in each Section. In addition a number of consolation prizes will be awarded. In the case of a tie for any prize, this will be equally divided among the successful competitors. Envelopes containing entries must be marked *"H.R.C. May Railway Photographic Contest"* in the top left-hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th May. The Overseas closing date is 31st August.

Competition Solutions

"January Missing Words Contest"

This contest did not cause a great deal of trouble to competitors, and as soon as the key word "ganger" was discovered, there was little difficulty in filling up the gaps.

The missing words in the order in which they should be inserted, are as follows: Ganger, disaster, patrol, track, two, keys, fishbolts, springtime, hot, cold, fishplates, tar, expansion, contraction, expansion, occurrence, buckling, hot, surface, ganger, knees, rail, track, granite, track, chippings, sleepers, shovel, level, hollows.

"January Voting Contest"

The voting in this contest bears out our statement that all H.R.C. competitions are favourites, for all received good support and in some cases only two or three votes separated subjects in the list. The result was as follows: (1) "Missing Links"; (2) "Photograph Voting"; (3) "Locomotive Peculiarities"; (4) "Locomotive Silhouettes"; (5) "A Nightmare Goods"; (6) "Spot the Errors"; (7) "Jumbled Names" and (8) "Famous Trains."

COMPETITION RESULTS

HOME

March "6th Locomotive Name and Number Contest."—First: D. V. C. Bentley (24591), Loughborough. Second: G. H. Gill (36093), Chorlton-cum-Hardy. Third: E. W. Oglethorpe (46851), Harrow.

March "Railway Photo Contest."—First: C. Spencer (44179), Sheffield 11. Second: H. S. Darke (4461), London, N.W.11. Third: V. Lane (35556), Dublin.

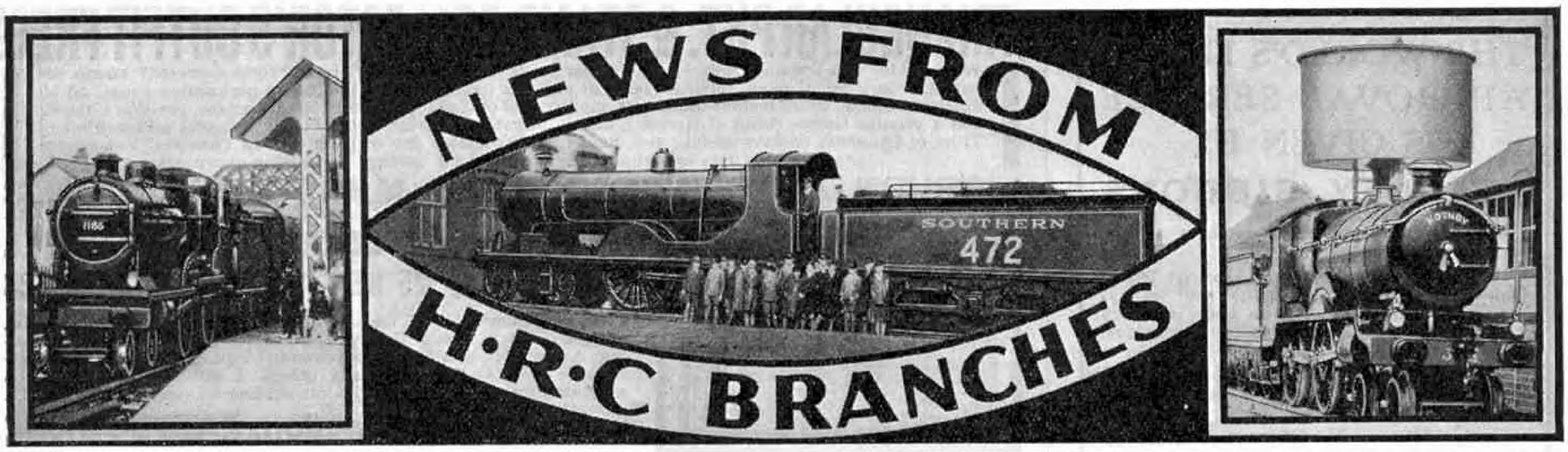
March "Drawing Contest."—First: A. Marsh (20196), Coventry. Second: E. F. Whipp (45828), Plymouth. Third: R. W. Goodfellow (3593), Longbenton.

OVERSEAS

January "Missing Words Contest."—First: D. Murison (37642), Buenos Aires. Second: W. A. Carpinter (42509), New Zealand. Third: M. Van Olst (16062), S. Africa. Fourth: R. Pearson (29199), Australia. Consolation Prizes: I. Brough (9112), Australia; O. M. Mangourie (38666), Egypt; V. East (21196), West Australia.

January "Railway Photo Contest."—First: R. Pearson (29199), Australia. Second: G. Healy (43145), Canada. Third: J. Jasper (42664), Australia.

January "Voting Contest."—First: D. Parker (38595), Canada. Second: J. C. Carter (46374), South Africa. Third: P. Sevestre (43525), France. Fourth: A. McIntyre (30925), Canada. Consolation Prizes: A. G. Fellows (29952), New Zealand; W. A. Carpinter (42509), New Zealand.



Branch News

SPRING GROVE CENTRAL SCHOOL.—Interesting developments have occurred in the operation of the Branch layout. Correct single line working on the staff system has been successfully tried. Various members take it in turn to supervise the train working and some have assisted the Chairman in the construction of a large model crane. Quite heavy weights can be picked up by electro-magnetic means. Secretary: S. Cordrey, 211, Hounslow Road, Hanworth, Middx.

RUTHERGLEN (GLASGOW).—The track baseboard has been rebuilt and after trying out various layouts, members planned a new permanent track. Double track is installed throughout and the system is complete with marshalling yards, engine sheds and carriage sidings. With the members becoming more experienced the standard of train working has improved and the mishaps experienced in the earliest stages are now very rare. A Branch library has been formed and a regular games night, and cycling and walking sections, are proposed. It is interesting that the Branch room overlooks the Glasgow-London main line of the L.M.S.R., so that it is an excellent point for the observation of real practice. Visits are to be made to the L.M.S.R. Motive Power Depot at Polmadie and to the Queen's Park Works of the North British Locomotive Company Ltd. Secretary: R. G. Langmuir, 11, Afton Street, Shawlands, Glasgow, S.1.

ST. THOMAS (EXETER).—The Branch is now well settled in the new quarters; on the Branch layout electricity is replacing clockwork as the motive power. The conversion of the rails from clockwork to electric has been carried out at special meetings held four times weekly. This has ensured the rapid conversion of the whole system. The attendance of members continues to be very satisfactory. In addition to the future work involved in the conversion of the layout, a Branch library is to be established. Secretary: L. G. Robinson, 9, Union Street, St. Thomas, Exeter.

ADDISCOMBE.—A permanent track is now available, but further extensions are proposed. The rapid laying of fresh track will be ensured by the special organisation of the members for this purpose. The layout represents the G.W.R. system and, when it is completed, a service of trains will be operated that will reproduce all the chief features of the important G.W.R. services. The Branch has recently celebrated its second anniversary and its affairs generally are satisfactory. Secretary: G. Chandler, 62, Ashburton Road, Croydon, Surrey.

ISLINGTON.—After careful preparation the first exhibition held by the Branch was very successful. Various new members have joined as a result and, with increasing membership, the Branch is to be divided into Senior and Junior Sections. The track already in commission has been reserved for the use of the Juniors and the Senior members are now busily engaged in laying a line for their own use. A talk on the various famous clocks in the world proved very interesting, and particular enthusiasm greeted the exhibition of films showing the visit of *"The Royal Scot"* to America, and its subsequent tour in this country. Future arrangements will include games and other film programmes are anticipated. Secretary: E. Muxlow, 7, Regents Park Road, Islington, London, N.W.1.



Some of the members of the Northampton H.R.C. Branch No. 284 on a visit to the local goods yard. Chairman: Mr. G. L. D. Hodges; Secretary: D. K. Adams. This Branch was incorporated in 1935 and maintains an attractive and interesting programme, track meetings, lectures and discussions being varied with visits to places of railway interest.

WATERLOO (DUBLIN).—Train services on the Branch layout suffered a sudden temporary stoppage recently when the electricity supply failed. Trains already in motion were delayed and subsequent services were operated correspondingly late. With the adoption of a new timetable further motive power has become necessary and four new locomotives are to be obtained during 1936. An attractive feature is that all trains and station buildings are electrically illuminated. Secretary: S. B. Carse, 38, Oakley Road, Ranelagh, Dublin.

ELMSIDE (EXETER).—Consistently good attendance at meetings has resulted in a great deal of traffic pressure on the Branch layout. In order to ease matters a two-minute service of trains has been introduced and, after certain difficulties in the early stages, timetable workings are now carried out in a prompt and efficient manner. Recently a locomotive failure unfortunately occurred at an exceedingly busy period, but the position has since been eased by the addition of two locomotives belonging to one of the Directors. Minor alterations are made for convenience in standard running arrangements. Train mileage continues to increase so that it is probable that the traffic figures for 1936 will considerably exceed those for last year. During 1935 a total of 940 trains was run. Of these 144 were expresses, 744 were excursions, locals and goods trains, and the remainder were specials. Altogether they covered over 80 actual miles. Secretary: T. W. A. Smith, 98, Ladysmith Road, Exeter.

ITALY

MILAN.—The decision to institute a Meccano Model-building Section has been greatly approved. It is intended that the Meccano and Hornby train section shall work closely together and some interesting and realistic arrangements are expected to result. The programmes for 1936 are to be even more varied and interesting than before. At a general meeting of the Branch earlier in the year, the officials for the year were elected. Secretary: E. Vigo, Corso Genova 19, Milan, Italy.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below:

BLABY—G. Thompson, Tre-vue, Welford Road, Blaby, Nr. Leicester.
BIRMINGHAM—E. T. Merriman, 20, Dyas Avenue, Walsall Road, Great Barr, Birmingham.
BOLTON—L. Monk, 30, Barcroft Road, Smithills, Bolton.
DUBLIN—S. Smartt, 11, Villa Bank, Royal Canal, Phibsborough, Dublin.
HASTINGS—G. Hills, Mornington House, 21, Wellington Road, Hastings.
HESTON—L. W. Jones, 26, Archard Avenue, Heston, Middlesex.
KENDAL—B. Bland, 75, Highgate, Kendal.
KNUTSFORD—A. Johnson, Cleabarrow, Plumbley, Knutsford, Cheshire.
LIVERPOOL—J. B. Brough, The Torrs, Score Lane, Broad Green, Liverpool 16.
NEWTON ABBOT—H. Dent, "Burwood," 17, Keyberry Road, Newton Abbot, Devon.
NOTTINGHAM—W. Lovelady, 7, Taunton Road, West Bridgford, Nottingham.

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FREE WONDERFUL 1936 OFFER 25 NEW ISSUES AND NOVELTIES

Including **Andorra** (1935), fine new **Cayman Islands** (map of the Islands), obsolete Austria, China, Denmark, **Gwalior** Service, Hungary (Statesman Szechenyi), **new Kenya** (Kavirondo Cranes), **Roumania** (new portrait of King Carol), and many others. I will send this collection **absolutely free** to all stamp collectors sending 2d. postage (abroad 4d.).

G. P. KEEF, Willingdon, EASTBOURNE

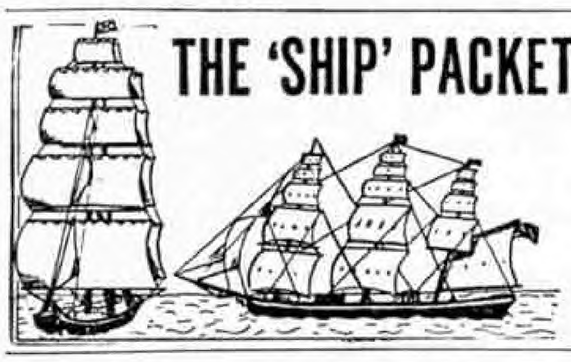
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OF UNSORTED STAMPS ON THE MARKET with 15 years' reputation behind it. It contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **MANY RARE STAMPS** have been found in it. 1 pkt., 1/6; 3 pkts., 3/9. 5 pkts., 6/–. All post free inland. Colonies 3d. per pkt. extra. Foreign, 6d. extra.

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O. NERUSH (Dept. A), 68, Turnpike Lane, Hornsey, London, N.8

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This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **GABOON,** a rare **FOOCHOW** (War Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **SENEGAL** (new pictorial), **NEW CALEDONIA, IVORY COAST, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, SOUTH WEST AFRICA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO-CHINA, F. OCEANIA,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **4 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA, 100 BRITISH COLONIALS 1/–, 20 AIRPORT 6d., 6 TRIANGULARS 6d., 50 PERSIA 4/–, 2 ASTRID** (mourning stamps) **2½d., VOLUMES OF B.O.P. CHEAP.**



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SETS (POSTAGE EXTRA)

10	Danzig	2d.	20	Austria	2d.
20	,,	6d.	20	Belgium	2d.
4	Cayman Is.	6d.	20	Czecho	2d.
5	Kenya	3d.	20	Denmark	4d.
4	Kenya, Uganda & Tanganyika	3d.	20	Egypt	6d.
4	Labuan	7d.	20	France	2d.
8	,,	1/3	20	Greece	4d.
4	Memel	3d.	20	Germany	2d.
8	,,	7d.	20	Holland	2d.
5	Silesia	2d.	20	Hungary	2d.
3	Grenada	2d.	20	Italy	2d.
5	Newfoundland	2d.	20	Portugal	2d.
5	Gold Coast	3d.	20	Poland	2d.
			20	Sweden	2d.

J. RUSSELL
23, Shanklin Drive, Westcliff-on-Sea

The "NEW TRANSPORT" Packet

Contains a wonderful assortment of 44 foreign and colonial stamps including the following which depict various means of transportation, **Tunis** (water carrier), **Senegal** (bridge and boats), **Mauratinia** (crossing desert), **Mid. Congo** (train and bridge), **Sth. Africa** (ship), **Germany** (aeroplane), **Austria** (horseman), **Indo China** (boat), **Mozambique** (aeroplane), **Gaboon** (raft), **Greece** (bridge and liner), **St. Pierre and M.** (trawler), **Fr. Guinea** (native carriers), **Dutch Indies** (Steamboat), **Madagascar** (native transport), **Brazil** (aeroplane), **Belgium** (train), **Roumania** (aeroplane), **Newfoundland** (steamship), **Fr. Morocco** (camels). Price **6d.** All purchasers asking for approvals will receive **Travancore** pictorials free.

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4, MARLBOROUGH ROAD, LONDON, S.W.19.

STAMP COLLECTORS' DUPLICATES from ½d. each. 2d. in 1/– discount. One only complete set. 77 copies "World of Wonder," good condition, 10/–.—Caller, Crantock, Newquay, Cornwall.

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From which you may select any 100 for 3/–. This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/– each or more. (I do not sell less than 100.)

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6 Cuba or 6 Imperial China or 6 Straits Settlements or 6 old French, etc. Just send stamps value 2d. and ask for my Approval Sheets containing some high value stamps at low prices and with progressive discounts. State which set of stamps desired to be sent free.

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9 Columbus, 5 Ships, 3 Air, 1 Triangle ... **9d.**
7 'Goya' Comm., incl. 2 Air ... ... **6d.**
7 'Goya' Comm. **AIR MAILS ONLY** **1/–**
WANTED TO BUY! USED COLONIAL JUBILEES. Correspondents wanted in all Colonies. No stamps will be despatched from 9th–25th May, 1936.
Cash with order. Postage extra.
T. R. Hughes, 'Ibis Cottage,' Long Park, Amersham, Bucks.

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(British 1840 Penny Black) for P.O. 2/–! It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further 5/– (cat. 15/–)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/–) for 12/6; 4d. blue (cat. 15/–) for 5/–; and 6d. pale lilac (cat. 40/–) at 12/6. Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**

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EDWARD SANDELL, 10, EVELYN GROVE, SOUTHALL, MIDDLESEX, ENGLAND.

For other stamp advertisements see pages 304 and XVIII.



MAP STAMPS

THE stamp collector who is seeking a summer task that will provide him with enjoyable occupation on rainy days would find just the thing he seeks in the preparation of a collection of map stamps. A complete collection would comprise less than 50 stamps, every one of them possessing an interesting history, and not one of the stamps would be an expensive purchase. We illustrate on this page a few suitable specimens, and the stories attached to these will be more than sufficient to show the fascination of a complete collection.



In the *"Stamp Gossip"* notes in our last issue we reproduced the 1 peso stamp from the recent Argentine issue, and as this stamp illustrates the point that we wish to make, we are reproducing it again this month in company with the Falkland Islands 3d. stamp of 1933. The latter shows a map of the islands, which are the subject of dispute between the Argentine and British Governments. The Falkland Islands stamp was issued to commemorate the centenary of British administration. The Argentine stamp, however, insists that the islands are Argentine property, and it will be observed that the special colour used to pick out Argentina on the map is applied also to the Falklands.



The British Minister in Buenos Aires has been instructed to inform the Argentine Government of Britain's disapproval of this stamp, but it is unlikely that this disapproval will be followed by a refusal to recognise the stamp and a surcharge on all letters bearing it, which was the course taken by Argentina in dealing with the Falkland Islands stamp.

Not all disputes in which postage stamps have been used as propaganda have been amicably settled, and at the foot of the page we show Paraguay's $1.50 stamp of 1932, a stamp that might be described as a gesture of defiance. The south-western areas of the Gran Chaco are Argentine territory. The northern districts were divided almost equally between Bolivia and Paraguay by a treaty concluded in 1895, but unfortunately the boundary was not clearly defined and in time it became a matter of keen dispute between the two countries. In 1927, Paraguay brought the issue to a head by issuing a new series of stamps that included a map design in which the whole of the disputed territory was prominently labelled *Chaco Paraguayo*. Bolivia immediately retaliated by issuing a map stamp that labelled the territory *Chaco Boliviano*. The stamp war was followed by clashes between the frontier guards of the two countries and quickly a war broke out that cost both countries many men and much money before peace was finally achieved.



War almost broke out on the Island of Haiti over a similar incident. This island consists of two republics, Haiti and Dominica. In 1900 Dominica issued a map stamp on which the boundary between the two republics was so wrongly defined as to leave Haiti with only a very insignificant strip of territory. Patriotic citizens of Haiti banded themselves together and prepared to resist this "invasion." Fortunately Dominica's mistake was perfectly innocent and the responsible artist having publicly admitted his error, peace was restored before any serious clash of arms occurred.



Turning to disputes of a lighter nature, the newly issued Costa Rica 4c. stamp shown here is of special interest. The map is of Treasure Island or, to give it its official name, Cocos Island. This stamp is intended to proclaim Costa Rica's ownership of the Island, but the action is more precautionary than inspired. Costa Rican rights over the island have been generally acknowledged for many years, and dozens of treasure hunting expeditions have taken out licenses from that country permitting them to seek the pirates' hoards that are commonly supposed still to lie buried there. No important success has ever been recorded, but no doubt the lure will persist so long as this tiny island remains above the waters of the Pacific.

In 1897 a British Admiral and a party of bluejackets landed on the island and calmly started blowing it to pieces, presumably in the hope that the upheavals would uncover one or another of the hidden treasures! A prompt protest was made by Costa Rica, and the British Government's response was to place Cocos Island out of bounds for the Navy.

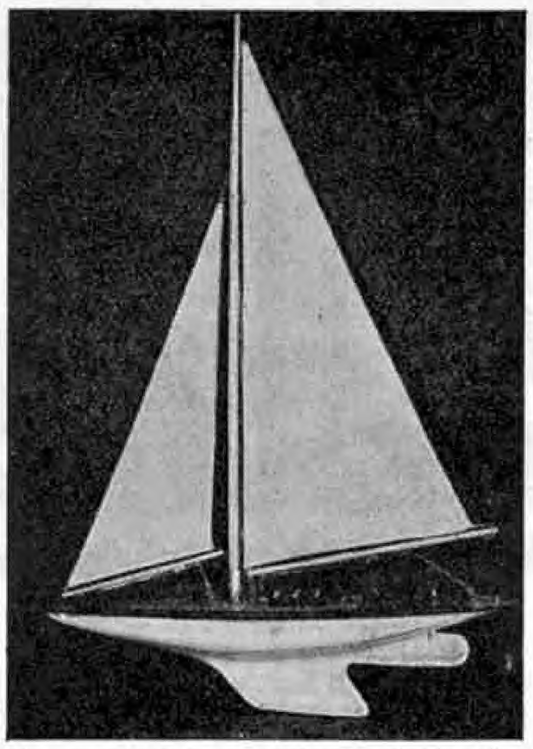
The majority of map stamps celebrate peaceful happenings, however, and the 1931 Newfoundland Atlantic map stamp, illustrated here, is one of the most interesting of all records of early trans-Atlantic flights. The stamp shows the routes taken on the early trans-Atlantic flights, including those of Hawker, Alcock, and Lindbergh. Newfoundland has issued two other map stamps at various times, but their interest is of a purely general and geographical nature.



Map stamps often are used to record the progress of development, as in the Canadian Confederation Jubilee issue of 1927 shown here. The stamp illustrates the growth of the Dominion from the early days of the original union of New Brunswick, Nova Scotia, Ontario and Quebec, formed in 1867 and represented by the heavily-shaded portion, to the vast territory that is the settled Canada of to-day.



There is not space here to touch upon more than a few of the map stamps that detail interesting historical tales, but any reader who desires to follow up this fascinating subject can obtain a full list of the suitable stamps from the Editor of the *"M.M."*



BOND'S

The 'Endeavour' Yacht.

Will sail in any weather.

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder	11/-
21 in. Yacht with automatic rudder	17/6
27 in. Yacht with Braine type steering	37/6
36 in. Yacht with Braine type steering	69/-

Carriage extra.

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This Super Sailcloth is made from the finest **Union Silk** and is very light, extra strong. **2/3** yard, 42 in. wide. Plus Postage.

Send for Bond's 1936 Catalogue, it has 180 pages filled with all types of Locomotives, Boats, Aeroplanes, Tools and Materials. Price **6d.** post free.

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If you want to get on in the world you must look clean and smart. Untidy hair will destroy the whole effect of smart clothes. Always put Anzora on your hair every morning—then you will be sure of neat, tidy hair all day long. Anzora has been the supreme, Gold Medal hair fixative for generations and still stands supreme. Anzora suits every head—Anzora Cream for greasy scalps, Anzora Viola for dry scalps. In 9d., 1/3 and 2/3 bottles. Anzora Brilliantine for those who prefer glossiness. In 1/- bottles.

From all chemists, hairdressers and stores.

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Beautiful Air Mail Stamps sent direct to you from country of origin on special covers.
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Write, enclosing 1½d. stamp for reply, to

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Jubilee, New Ceylon, used Colonials free! Request appros. Post 1½d.—G. Kingsmill, New Barnet, Herts.

TRIANGULAR PACKET FREE!

We have managed to obtain a further **limited supply** of the rare and beautiful **triangular** issued by Spain in memory of the explorer Columbus and depicting his Flagship Santa Maria. We will give this wonderful stamp together with 10 different Spain, to all readers requesting approvals and including 2d. postage. (Abroad 6d.) Price of the gift without Approvals is 8d.

MICHAEL HERBERT (M.M.),
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BOOKS of British Colonials or Foreign or mixed Stamps sent on approval. Select what you desire at the rate of 2/- for 50 or 3/6 for 100 Stamps. These books contain stamps catalogued at prices up to half a crown each, or more.—P. Illingworth, Tranmere Park, Guiseley, near Leeds.

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All customers enrolled. Do you want rarities, sets or cheap packets? Write to me. Have you got these stamps?
Obsolete mint set Mozambique Triangles 2/-; 200 Space-fillers 8d.; 20 Latin-American 6d.; 25 Airmails 1/-; 50 Victoria British Colonials 1/6; 6 1935 Persia Airpost 1/6.
Thousands of stamps in stock.
Approvals and Monthly Bulletin on request.
F. J. LORD, 13, PRINCES ROAD, STAMFORD.



UGANDA & R.C.M.P. PACKET

This packet contains the best of our two previous packets, with some additional good stamps. **New Uganda** (illustrated), **10c. Canada 1935** (Royal Canadian Mounted Policeman), New Belgium (Train drawn by Diesel engine), **New Zealand 1935** (Kiwi bird), **Long set of 13 different Italy** (Foundation of Rome), Hungary (prisoners of war), China (Sun Yat Sen), U.S.A. (Olympic Games), **Ceylon 1935** (native tapping rubber tree), Siam (double head), **Australia Jubilee,** and **ten different Canada** including the above and **Canada Jubilee. All these new stamps for 4½d. only** to genuine applicants for our approval sheets. (Without approvals, 9d.)

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FREE!!

NEWFOUNDLAND JUBILEE PACKET

Here is an opportunity to have a fine collection of stamps from the oldest **BRITISH COLONY.** This grand packet contains a **RARE SILVER JUBILEE,** portraits of Queen Victoria, **KING GEORGE V;** also Map of the Island, Statue, View of Trinity, etc., etc. This wonderful **FREE** packet is offered to all genuine collectors sending 2d. postage, etc. (6d. abroad), and asking for approvals.

S. CAMPBELL, 71, MANOR ROAD, TANKERTON, KENT.

100 diff. Stamps Free to approval applicants, good discount.—Gosling, 21, Powling Road, Ipswich.

100 Diff. Stamps Free to appro. applicants. Liberal dis. —Cuthbert, Newsham Lane, Broughton, Preston.

ANOTHER GLOBE-TROTTER TRIUMPH!

AMAZING FREE SILVER JUBILEE PACKET OFFERED FOR ONE MORE MONTH. Silver Jubilee varieties, Beautiful Airmails, Pictorial Commemoratives, New Issues, Colonials—60 magnificent stamps. The most sensational offer yet. Send 1½d. postage for "Globe-Trotter" approval selections—amazing value, ¼d., ½d. and 1d. upwards—and particulars of how **you can have FREE stamps every 14 days!!** Write Now—there's a stamp treat in store for you. Owing to immense popularity of the above offer and letters of appreciation, I am repeating same for one more month—don't miss it. **Special Offers.** "Globe-Trotter" Mystery Mixture, 1,000 unsorted, unbeatable, 1/6.

GLOBE-TROTTER, 17, WINCHESTER ROAD, BIRCHFIELD, BIRMINGHAM.



GREAT EASTERN OFFER

We have just completed a huge purchase of stamps from the Near East, for the special benefit of "M.M." readers. Magnificent large **Pictorials** and **Airmails** of **Lebanon, Egypt, Syria, Alaouites, Latakia, Iraq,** and **Trans-Jordan,** with high values to 4 piastres are special features. This mixture is being supplied in generous packets. **FREE and POST FREE,** for one month only, to applicants requesting approvals from

UNIVERSITY STAMP CO., 13, WALTON WELL ROAD, OXFORD

For other stamp advertisements see pages 302 and XVIII.



Stamp Gossip

and Notes on New Issues



Nigerian Pictorials

Among the last of the British Colonial King George pictorial issues, the recent Nigerian set is certain to take a high place, by reason of the beauty and the interest of the designs, which are as follows:—½d. (illustrated), a cargo steamer loading at the Apapa wharf, Lagos, 1d., native picking cocoa pods. Nigeria's cocoa exports are one of the Colony's greatest sources of revenue. 1½d., a tin dredger at work. Tin is another of the country's principal exports. 2d., tree felling. 3d., a fishing village. 4d. (illustrated), an up-to-date cotton ginnery. Cotton spinning is not yet one of the country's big industries but it is rapidly growing, because the climate is suitable both for the growing of the cotton plant and the spinning of the cotton itself. 6d., a Habe minaret at Katsina. The Habes are an advanced native race. 1/–, native cattle belonging to the Fulani tribe. 2/6, the Victoria-Buea motor road. 5/–, a native girl and a palm. Palm oil is another of the Colony's principal products. 10/–, the railway bridge across the river Niger at Jebba. This bridge carries the line from Lagos to Kano, the present terminus of Imperial Airways' Nigerian service. £1, native canoe on the Niger.



The Malayan Postal Union Issues

In our "Stamp Gossip" notes in the March "*M.M.*," in dealing with the newly issued stamps of the Malayan Postal Union, we drew particular attention to the Selangor stamp, in the design of which the name of the state is shown in native characters, as distinct from the remaining issues, in which the name appears in English. We understand from *Gibbons' Stamp Monthly* that the reason for the name appearing in other than English characters is that H.H. the Sultan preferred the use of Jawi characters (these are the script commonly used in Malaya), and that the design as approved was better balanced than it would have been if the wording had been in English.



The design is reproduced in our March "Stamp Gossip" page, and readers will be interested to know that the name "Selangor" is represented by the characters in the panel at the foot of the stamp, while the panel on the right of the stamp gives the word "Postage" and that on the left the words "and Revenue."

We hope to show other of the new Malayan stamps in an early issue.

New German Issues

There have been many issues of commemorative air stamps, but very few have possessed the interest attaching to the recent German Lufthansa commemorative, illustrated on this page. This stamp commemorates a really important air event, the foundation of the famous German air line, the Deutsche Luft Hansa, ten years ago.

The words Luft Hansa mean Air Union, and Luft Hansa on its formation in 1926 took over the complete network of air services then existing in Germany. Gradually it extended its operations into Russia, Scandinavia, Italy, England, and into Asia as far as Persia. More recently, a line has been thrown over to South America via Spain and North Africa, to link up with the German Condor Syndicate's operations in Brazil. Luft Hansa has been always in the forefront of progress technically, and its Junkers Ju. 52 machine is considered to be the finest air transport machine in the world. Its Heinkel 60 type is the fastest mail carrier.





The machine illustrated on the commemorative stamp is a Heinkel H.E. 70, a specially interesting addition to the list of aeroplane stamp designs because it is the first picture of a machine fitted with a retractable undercarriage.

Also we take the opportunity to show the portraits of Gottlieb Daimler and Karl Benz, the two famous motoring pioneers whose portraits were used on the German stamps issued to commemorate the 50th anniversary of the introduction of the motor car.

Gottlieb Daimler had worked in the factory of Otto, the famous pioneer of gas engines, and in 1884 he designed and brought out a light compact engine in which petrol was used as a fuel. He fitted this engine to a bicycle in the following year, and later to a motor car.

Karl Benz was the first to apply the petrol motor to light and practical road vehicles. His first car was produced in 1885. It had three wheels and an engine rated at ¾ h.p., and was capable of the then exceptional speed of 6½ m.p.h.!

Dr. Nansen Commemorative

One of the most interesting personalities of recent times was Dr. Findtjof Nansen, zoologist, scientist, explorer, diplomat, whose work at Geneva for refugees from distressed countries has recently been commemorated by charity stamp issues in Norway and France.



Dr. Nansen will best be remembered for his attempt to reach the North Pole in 1893-6. Though unsuccessful in achieving his objective, he penetrated farther north than any previous explorer. In 1906 he turned from exploration to diplomacy, becoming, in fact, the first Norwegian Minister to England after Norway's severance from Sweden in October, 1905. At the conclusion of the Great War Dr. Nansen took up the organisation of refugee relief work in Russia, and in 1923 he was awarded the Nobel Peace Prize. He died in 1930.

As our illustration shows, the design of the Norwegian stamp is a simple portrait of the great man whose work it honours. There were four stamps in this series with values and premiums ranging from 10 öre to 30 öre.

The French issue consisted of one stamp, 75c. value, bearing a premium of 50c., with an allegorical design representing progress and brotherhood.

New Zealand Anzac Commemorative

Although we are not yet able to reproduce a specimen of the stamp, we have had the pleasure of seeing an advance illustration of the New Zealand Anzac Commemorative, that was due to be issued at the end of last month. It is the most striking military stamp design that we have ever seen.

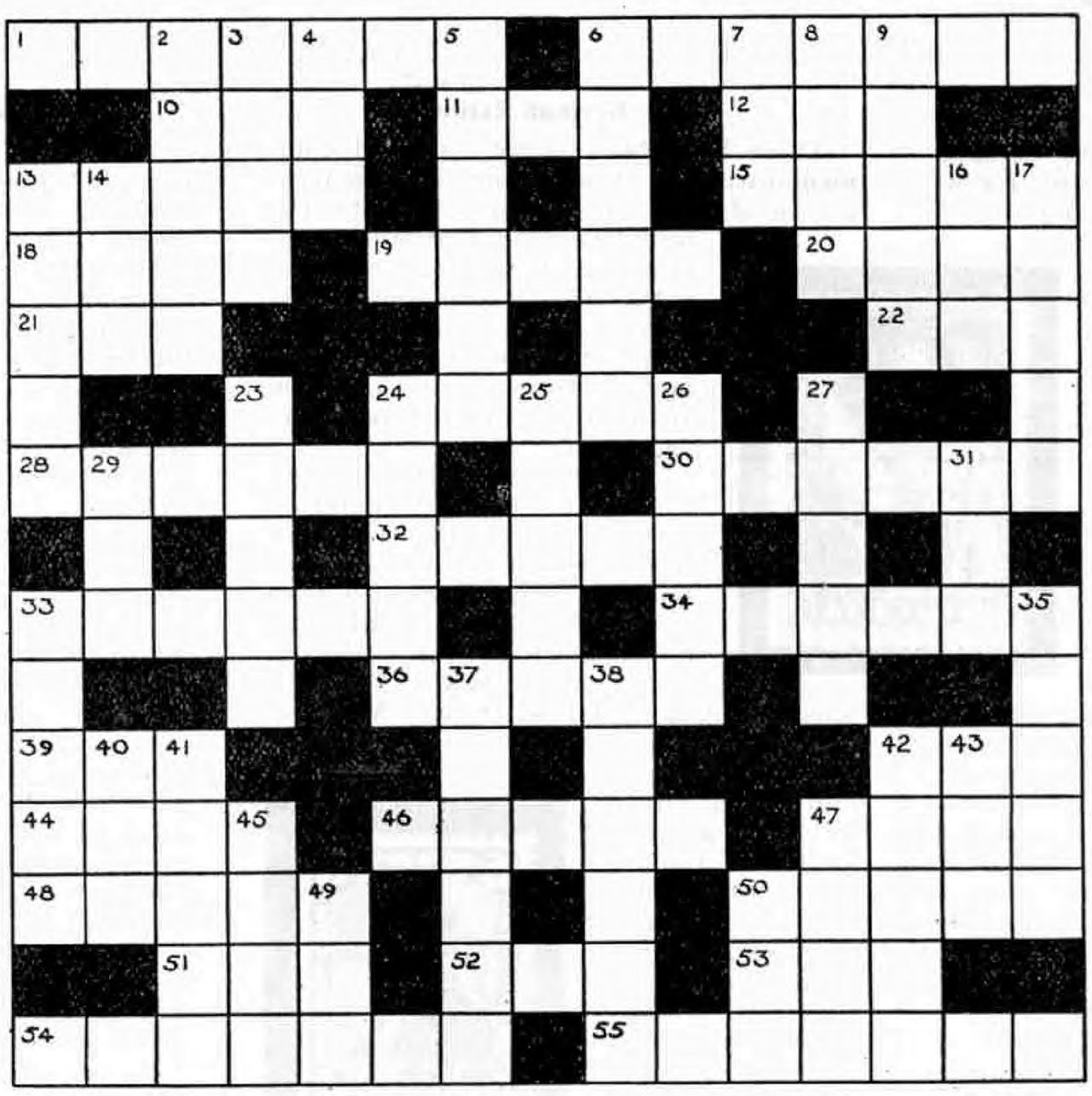


The stamp is issued to commemorate the 21st anniversary of the landing of the Australian and New Zealand Army Corps on the Gallipoli Peninsula during the campaign against the Turks, and shows a soldier of this famous Corps, in full kit, climbing over a heap of sandbags. In the background is shown one of the Gallipoli beaches and the precipitous slopes of the Peninsula.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations on this page have been made.

Competition Corner

MAY CROSSWORD PUZZLE



CLUES ACROSS

1. Retaliates
6. Refrains
10. Animal
11. Starting point
12. Consumed
13. Extended
15. Lukewarm
18. Species of cattle
19. Heavenly body
20. Female horse
21. By
22. Meadow
24. Attribute
28. Respect
30. Re-iterate
32. Boredom
33. Plan
34. Glum
36. Portions
39. Perch
42. Respectful address
44. Grass
46. Platform
47. Beak
48. Tainted
50. Sullen
51. Precious stone
52. Fish
53. Before
54. Attack
55. Cloth.

CLUES DOWN

2. Spill
3. Frank
4. Colour
5. Sharpens
6. Eliminate
7. Posed
8. Part
9. Part of flower
13. Headgear
14. Steel-edged tool
16. Wrath
17. Traded
23. Insecurity
24. Set right
25. Subsides
26. Shapes
27. Scanty
29. Prosecute
31. Animal
33. Springs nimbly
35. More than prompt
37. Commencement
38. Swallow up
40. Abroad
41. Hinders
42. Nymph
43. Unfavourable
45. Insect
47. Incinerate
49. Bird
50. Expanse of water

The "*M.M.*" series of crossword puzzles have enjoyed exceptional popularity, principally, no doubt, because they are set for amusement rather than strenuous competitive effort.

This month's puzzle will be found to follow the lines of the previous ones in that it is fair and interesting. The clues are all perfectly straightforward, and every word used can be found in Chambers' or any other standard dictionary. The rules that govern the solution of crossword puzzles are so well known that it is unnecessary to give any further explanation of the requirements of the competition.

Cash prizes of 21/–, 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the senders of the four correct solutions that are neatest or most novel in presentation. The prizes will be duplicated for the Overseas section, which is open to all readers living outside Great Britain, Ireland, and the Channel Islands.

Entries should be addressed "May Crossword Puzzle, Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 30th May. Overseas closing date, 31st August.

Competitors need not mutilate their magazines by cutting out the crossword illustration. Instead they may make a copy of the square on the same scale, or larger, and use that in submitting their entries for the contest. Readers who desire to have their entries returned, must enclose a stamped addressed envelope.

May Photo Contest

As we announced in our April issue, each month throughout the spring and summer we shall offer prizes for the best and most interesting photographs submitted.

Each month's competition will be divided into two groups, Home and Overseas, and these two groups will be divided into two sections, A for those aged 16 and over, B for those under 16. Cash prizes of 21/– and 10/6 will be awarded in each section.

The photographs may be of any subject and may be made with any make of camera, film or paper. Each photograph must bear the reader's name, age and address, and a title on its back.

Entries sent this month must be addressed "May Photo Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th May. The Overseas closing date will be 31st August.

Competition Closing Dates

HOME		
May Crossword Puzzle	... ...	**30th May**
May Photo Contest	... ...	**30th May**
OVERSEAS		
February Crossword Puzzle	...	**30th May**
February Drawing Contest	...	**30th May**
Meccano Limericks	... ...	**30th June**
March Drawing Contest	...	**30th June**
Vocation Voting Contest	...	**31st July**
April Photo Contest	... ...	**31st July**
May Crossword Puzzle	... ...	**31st August**
May Photo Contest	... ...	**31st August**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

COMPETITION RESULTS

HOME

Meccano Limericks.—Last Line Section.—1. B. Hardie (Bristol). 2. H. V. Stopes-Roe (Dorking). 3. P. Coley (Birmingham). 4. R. Jamieson (Liverpool). Consolation Prizes: S. C. Procter (Carshalton); J. Allen (Birmingham). **New Limerick Section.**—1. W. Whitaker (Hornsea). 2. K. Watts-Jones (Chatham). 3. P. B. Whitehouse (Birmingham). 4. E. Raymond Andrew (Wellingborough).

March Drawing Contest.—First Prizes: Section A, D. V. Gibbs (Dundee); Section B, J. S. Taylor (Burnley). Second Prizes: Section A, E. Whitaker (Leeds); Section B, K. Clark (New Chiswick). Consolation Prizes: J. G. Hall (Cottingham); D. A. Lambert (Ilford); R. Lawton (Gt. Crosby, Liverpool); E. H. Whalley (Redcar).

OVERSEAS

March Drawing Contest.—First Prizes: Section A, W. Figgins (Wellington, N.Z.). Section B, M. Conly (Dunedin, N.Z.); Second Prizes: Section A, M. Azees Ahmed (Mysore). Section B, W. Thomson (Maylands). Consolation Prize: S. Eriksson (Taranaki, N.Z.).

Christmas Essay Contest.—1. G. Caband (Vaud). 2. W. A. Carpinter (Christchurch, N.Z.). 3. D. Murison (Buenos Aires). 4. G. Cali (St. Julians).

Advertisement Jig-Saw Contest.—1. R. Allen (Toronto). 2. H. Dressler (Breslau). 3. J. R. Hurst (Buenos Aires). 4. S. A. Kock (Heldinia).



ONCE BITTEN



Lady: "You would stand more chance of getting a job if you would wash and shave, and make yourself presentable."

Tramp: "Yes, lady. I found that out years ago."

* * * *

Teacher: "Tom, what is a cannibal?"

Tom: "Don't know, mum."

Teacher: "Well, if you ate your father and mother for dinner, what would you be?"

Tom: "An orphan, mum."

* * * *

Blinks: "Jones is the most successful salesman I know."

Jinks: "How so?"

Blinks: "Well, yesterday he sold Mrs. Jones two dozen stair rods."

Jinks: "There's nothing very successful in that surely."

Blinks: "I didn't think so until I knew she lived in a bungalow."

* * * *

The new farm hand was ploughing, and the farmer told him to keep his eyes fixed on some prominent object at a distance that would act as a guide.

Coming back later on, the farmer was amazed to find that the plough had been travelling all over the field.

"What on earth are you doing?" he roared.

"I did just what you told me, sir. I worked straight for that cow in the next field, but the darned thing wouldn't stand still."

* * * *

Scotland Yard circulated a strip of six photographs of a man who was wanted. Shortly afterwards a telegram from the head of a small country police force reached the Yard.

"Have found four of the wanted men," it ran. "Hope to get other two soon."

* * * *

The teacher had been telling his class about different coins of the realm. Suddenly he pulled from his pocket a two-shilling piece, and slapped it on the desk.

"What's that?" he asked.

"Heads, sir," said a boy in the front row immediately.

* * * *

First Tramp: "You're looking downcast, Tim. What's the matter?"

Second Tramp: "I've found a recipe for home-made cake, and I haven't got a home."

* * * *

Policeman (after a collision): "You saw this lady driving towards you. Why didn't you give her the road?"

Motorist: "I was going to, as soon as I could discover which half she wanted."

* * * *

"Old Barnes is going to retire from business for good now."

"Yes, but I've heard him say that before."

"The judge has said so now."

* * * *

Betty: "You don't look like an old lady any more, now you've had your hair bobbed."

Granny: "Don't I, darling?"

Betty: "No; you look more like an old man."

THE TOUGHER THE BETTER

Diner: "Do you serve crabs here?"

Waiter: "We serve anyone; sit down."

* * * *

Scotsman: "Mon, I'm in awful trouble."

Friend: "How's that?"

Scotsman: "My girl's jilted me."

Friend: "Oh, hard lines, old man."

Scotsman: "Ye havna heard the worst: I'd just bought a tandem."

* * * *

"Has Roberts sold anything since he took up novel writing as a career?"

"Oh, yes; his business, his house and his car."

* * * *

Madge (aged four) caught sight of some Brussels sprouts in a greengrocer's shop one day.

"Oh, mummy," she exclaimed, "look at those dear little dollies' cabbages."

* * * *

Foreman: "My man, you ought to take a pleasure in coming to work."

Workman: "Lumme, guv'nor, you'll be makin' me pay entertainment tax next."

* * * *

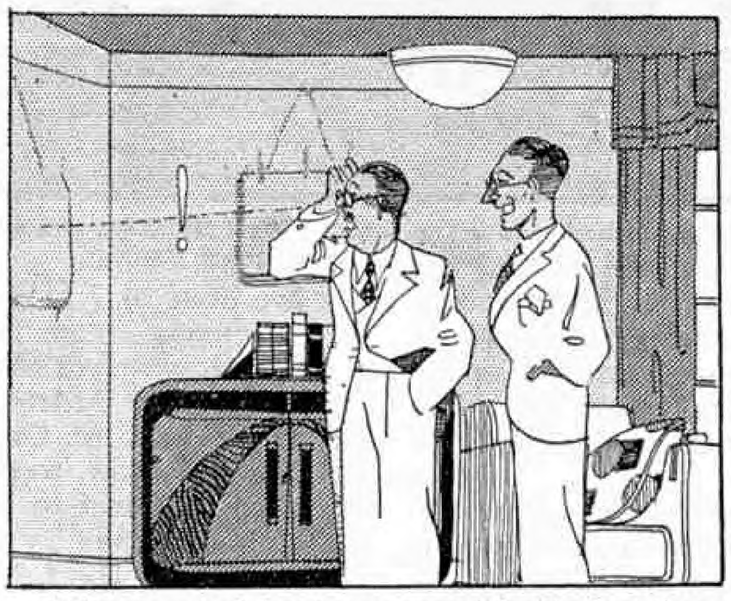
He had taken up motoring late in life and was describing his experiences to a friend.

"I'm sure you went through a good deal when you were first learning to drive," said the latter.

"M'yes; I certainly went through a couple of hedges, a fence, and at least one garage door."

* * * *

ABSENT-MINDED



Bill's house had just been papered for the first time, and he asked his friend to have a look at it, as he had done the work himself.

"It's all right," said his friend, "but what are those lumps under the paper?"

"Good gracious," exclaimed Bill, "I forgot to take down the pictures."

* * * *

Freddy: "See that man leaving the field, auntie? Well, he has been sent off for a foul."

Auntie: "Well, one fowl won't go far between 22 men."

* * * *

"Dinah," said the mistress of the house, "What do you do with those grapefruit skins you take away with you?"

"I carries 'em home, ma'am," confessed the negro maid. "I'se think they make my dustbin look stylish."

* * * *

The foreman looked the applicant for work up and down. "Are you a mechanic?" he asked.

"No sorr," was the answer. "Oi'm a Macassey."

* * * *

"I say, guard," asked a fussy old gentleman, poking his head out of the train, "Is this my station?"

"No sir," replied the guard. "It belongs to the Railway Company."

* * * *

Teacher: "Tell me what you know about ants."

Small Boy: "There are two kinds of ants, insects and lady uncles."

HARD LUCK

Convict: "Say, boss, don't you get papers to read in this place?"

Warder: "No, Spike, but I've bad news for you. Your ticket in the Christmas sweep won a world cruise."

* * * *

Lady (to little boy crying): "What is the matter, sonny?"

Boy: "It was the man in the shop. He's going to send the police after me."

Lady: "But that shop is an undertaker's. What did you want in there?"

Boy: "Empty Boxes."

* * * *

The teacher gave each boy three buttons: one stood for liberty, one for life, and one for happiness. Next day she thought she would test their memory.

"George," she said, "where are the three buttons, and what do they stand for?"

"Here's life and liberty," said George, taking two buttons out of his pocket. "Happiness is sewn on to my best trousers."

* * * *

"Why are you carrying that umbrella over your head?" asked an inquisitive old man of a small boy. "It isn't raining and the sun isn't shining."

"I know all about that," said the little boy, "but when it rains Dad takes it out with him, and when the sun shines Ma sits under it in the garden. This is the only chance I get to use it."

* * * *

Summer Boarder: "What a beautiful view that is."

Farmer: "Maybe. But if you had to plough that view, harrow it, cultivate it, hoe it, fence it and pay taxes on it, it would look quite ordnery."

* * * *

"Want a job, do you?" said the grocer. "Well, I'll take you on. What's your name?"

"Simpson, sir."

"All right. Go and unload the chests of tea from the van over there and carry them up to the storeroom over the shop; and while you are up there, bring down three barrels of butter."

"Excuse me, sir, I said Simpson, not Sampson."

* * * *

First Burglar: "If I can pick this lock, we can lay our hands on £50,000."

Second Burglar: "Is that so? Well, go carefully with my sixpenny penknife."

* * * *

Ex-convict: "Could you help a poor man who has just left prison?"

Old Lady: "You should be ashamed to own it."

Ex-convict: "I didn't own it, mum—I was only a lodger."

* * * *

A BARGAIN



A Scotsman new to London, sat on a chair in Hyde Park. "I'm no understandin' what ye're wantin', mon," he told the collector.

"Twopence for the chair, sir," was the reply.

At that the Scotsman rose and examined the chair closely. "It's no so dear, mon," he said. "I'm thinkin' I'll hae twa."

A Famous West Highland Steamer

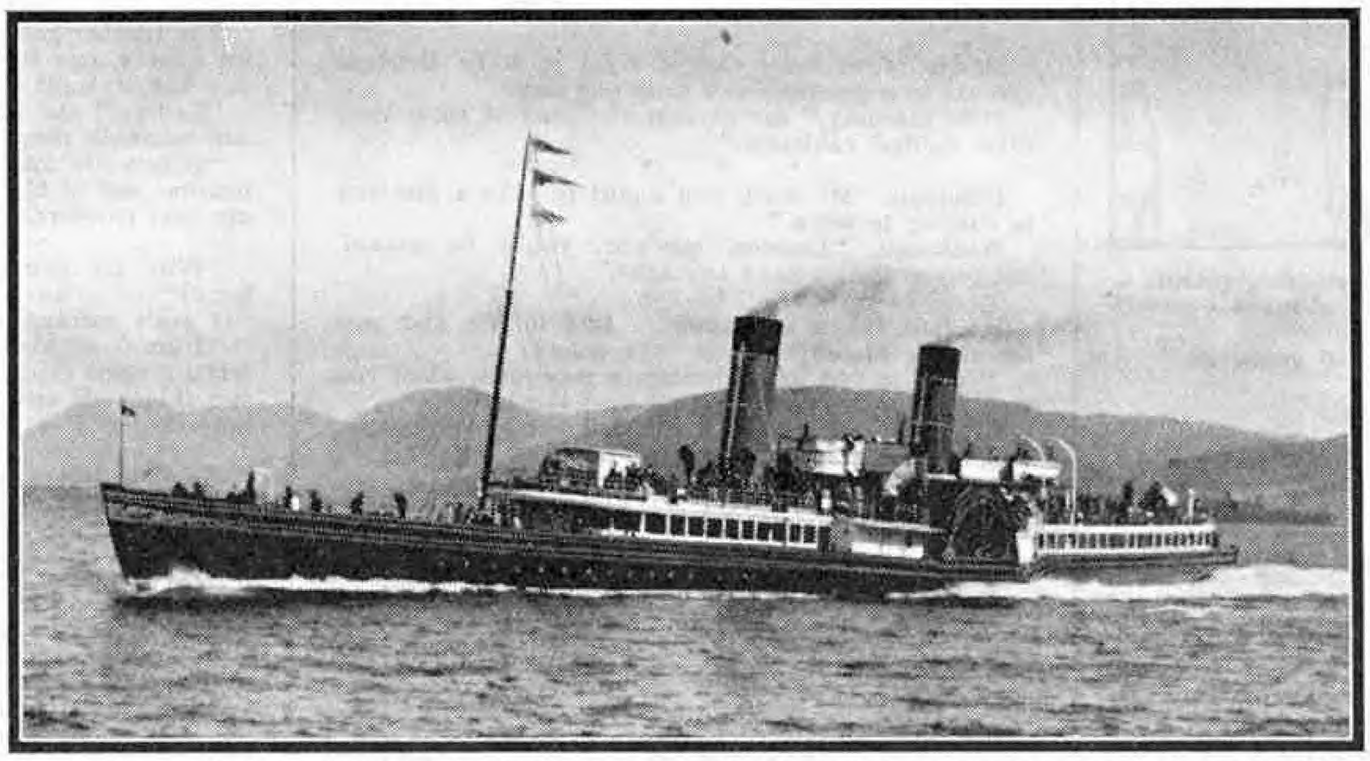
The Passing of the *"Columba"*

By J. H. Sutherland

CRUISES down the Clyde and in the West Highlands have been enjoyed by many thousands of people, who have learned to know well the vessels serving that wonderful holiday land. The most famous of all the ships engaged in this service undoubtedly was the paddle steamer *"Columba,"* which began her career in 1878, and many people all over the world will scarcely be able to credit the news that she will cruise no more. So intimately associated has this famous paddle-steamer been with the Firth of Clyde, that Scotland's holiday waterway will veritably appear incomplete without her.

In many respects the *"Columba"* has been a remarkable craft; indeed, the most outstanding of her time. Actually she was built in consequence of another company intruding into the West Highland steamer traffic which had long been regarded as the preserve of David Hutcheson and Co., her owners, and the predecessors of David MacBrayne Ltd. She cost approximately £29,000 and was launched on 11th April, 1878, at Thomson's yard at Clydebank, now carried on by John Brown and Co., the builders of the *"Queen Mary."* Though the manufacture of steel was then at an experimental stage, it was decided to construct the new boat of this material, and the policy proved to be eminently successful.

In due course the powerful paddles of the *"Columba"* began to churn a snowy wake over the route she was to follow for 57 years. Her length of 301 ft. greatly exceeded that of any other Clyde steamer, even in the post-war days of larger craft fitted with turbine engines. Her speed of 21 knots created a sensation and stamped her as the fastest boat to ply on the Clyde estuary, but in recent years she became slower and her rate of progress then would approximate more nearly to 18 knots. With two well-set-up funnels, painted bright red with black tops, she presented an imposing appearance and, as might be expected, met with public approval from the outset.



The "Columba" at speed in Rothesay Bay. This famous West Highland steamer was launched in 1878, and continued in service until last summer.

At the time of her appearance the *"Columba"* possessed all the latest improvements, including steam steering gear, telegraphs between bridge and engine-room, and steam warping-sheaves. The post-office on board was by no means her least remarkable novelty, for it was the first institution of its kind on a pleasure boat. In addition, the deck saloons were extended to the full width of the steamer, an innovation that provided a sumptuous and spacious retreat when climatic conditions were unfavourable. She was licensed to carry 2,000 passengers, and could boast of catering arrangements on a comprehensive scale—an important matter in the diversion of pleasure sailing, which is a great creator of appetites.

The vessel was fitted with twin-cylinder oscillating engines that were cranked to a shaft carrying enormous paddle wheels, the original wooden floats of which were later replaced by steel ones. The only other mechanical alteration effected took place in 1900, when two large "haystack" boilers working at a pressure of 50 lb. per sq. in. were installed instead of those of the "Navy" type formerly used, and on only one occasion did the *"Columba"* undergo any exterior transformation. This occurred in 1929, when an experimental shade of grey was applied to the hull. But so unsatisfactory was the effect, and so greatly incensed were those who knew her, that the old colour was restored in little more than a week.

The paddle boxes, with the fan-shaped vents common to all MacBrayne craft, were rendered particularly handsome because of their carved gilt-work. The bows also could boast of elegant scrolls that indicated the artistic sense of those who fashioned steamers in bygone times. These can be seen in our illustration.

For many years the *"Columba"* held greater prestige during August and September than any other paddler. At the beginning of the shooting season her decks were crowded with people following the West Highland route to their Scottish residences and lodges, and one can imagine the volume of traffic and amount of luggage transported in this annual rush to the north.

Although she was more than half a century old, the active life of the *"Columba"* did not exceed 20 years, for she was purely a summer excursion boat and for the greater part of her existence occupied moorings in the sheltered harbour of Bowling, where she was a familiar object as she floated tranquilly at the base of Old Kilpatrick's green, rolling hills, accumulating a coating of grime from the endless succession of passing ships and from the adjacent railway. Yet out she would come every June, spick and span as only a proud crew could make her, and capable of holding her own against all comers during her four months' service. In 1929 her winter quarters were changed to Greenock.

At a distance the *"Columba"* was reminiscent of the *"Iona"* and the *"Chevalier,"* older steamers belonging to the same company, for she had a similar design of fiddle-bow, and the same square stern and three-quarter length promenade deck. In truth, this type of rounded bow was already old-fashioned when the *"Columba"* took shape, but probably it was perpetuated in the newer boat as being a more harmonious factor than a straight stem.

For several decades the hour of 7.11 a.m. was synonymous with the departure of the *"Columba"* from Bridge Wharf, Glasgow. Thence she splashed her way down-river to Greenock, Gourock, Dunoon, Rothesay, Tarbert and finally Ardrishaig, accomplishing well over 150 miles on the round trip. At Greenock and Gourock she connected with trains from Glasgow, to suit those people who found the earlier start from Bridge Wharf to be inconvenient, and at Dunoon her decks were supplemented by many more passengers, including those borne thither by the L.N.E.R. steamer from Craigendoran. By the time Rothesay had been tapped in turn, there were sometimes incredible crowds to be seen aboard during the height of the season.

The writer retains a vivid recollection of the early part of the century, when the *"Columba"* gave evidence of her propensity for racing in matches against the *"Lord of the Isles,"* the equally well-known paddle steamer of a rival company. Both vessels were timed to leave Rothesay quay at the same hour, and away they went, with black plumes belching from their funnels, separated by little more than a dozen yards and following a course barely 100 yards from low-water mark. For over a mile their progress invariably afforded much excitement to interested spectators, but the *"Columba"* inevitably would take the lead towards the silver'd fairway between the distant hills. This daily scamper continued for several seasons.

This well-known steamer will no longer kick up her heels in the glorious rush from the "tail o' the bank" at Greenock; never again will she go spanking through the Kyles of Bute; no more will her wash provide a thrill to the occupants of innumerable rowing boats, and the folks who were wont to view her return to Bridge Wharf will await her in vain.

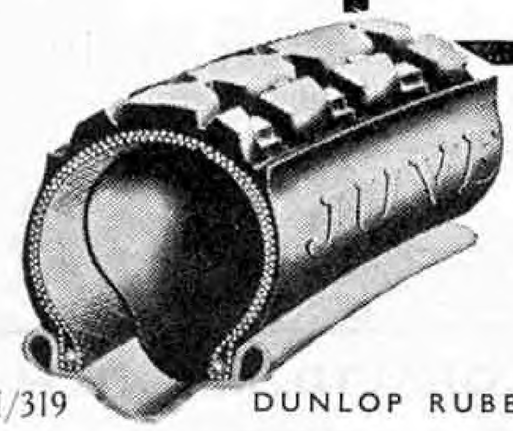
The writer recently paid his last respects to this old "flier." She lay moored in a corner of Greenock Harbour awaiting the highest bidder—a pathetic-looking object to anyone who knew her in her prime, yet in her misfortune bearing an air of dignity.

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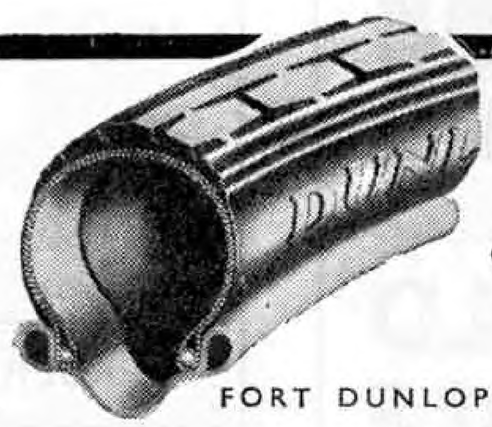
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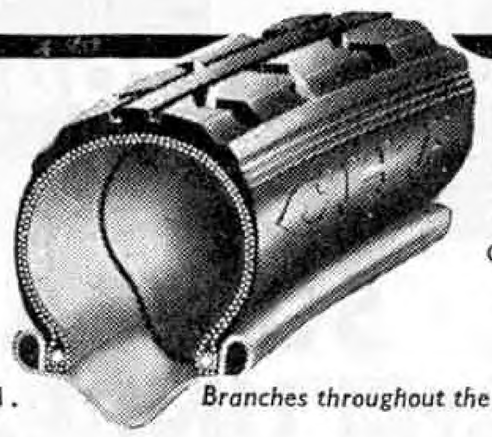
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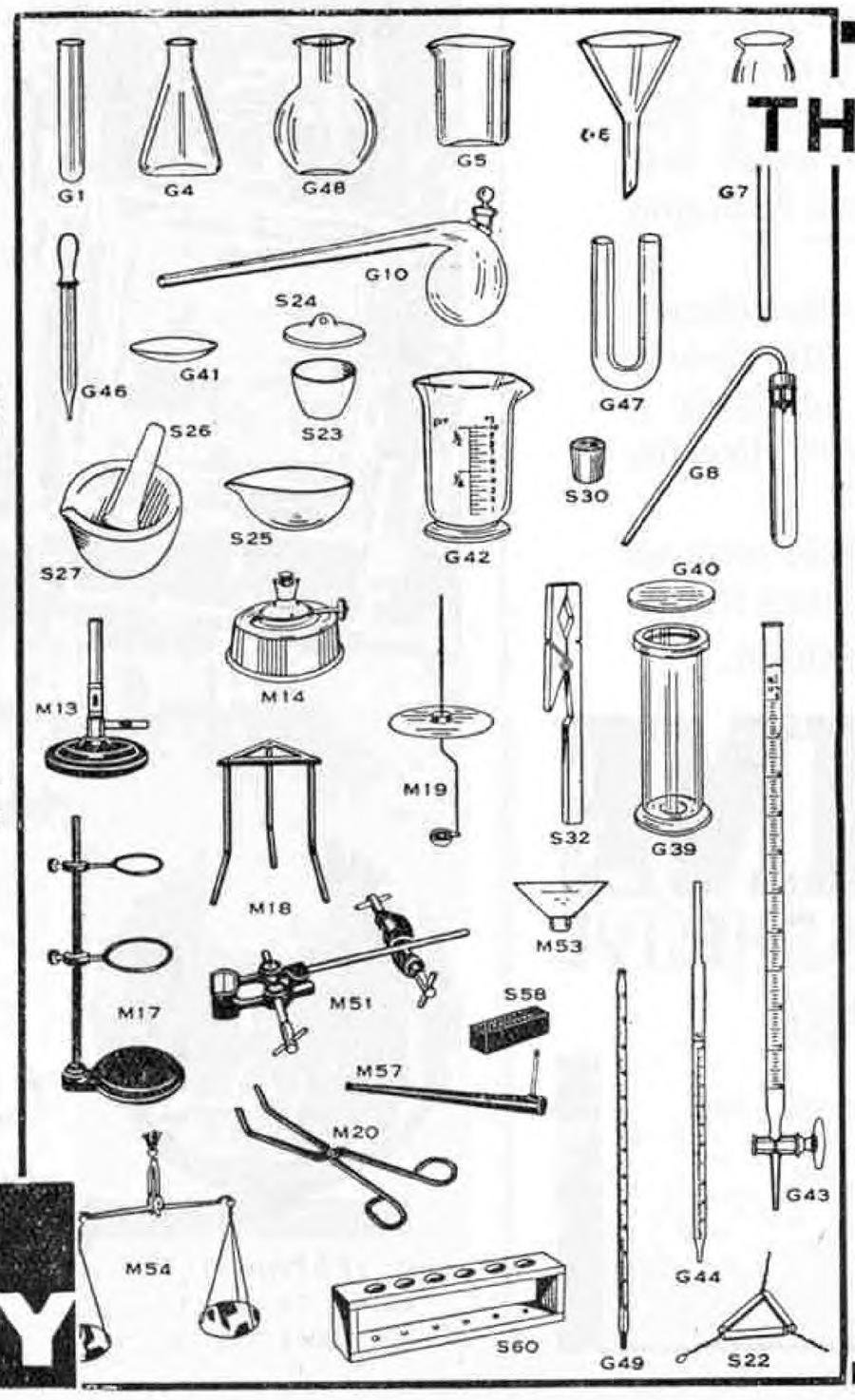
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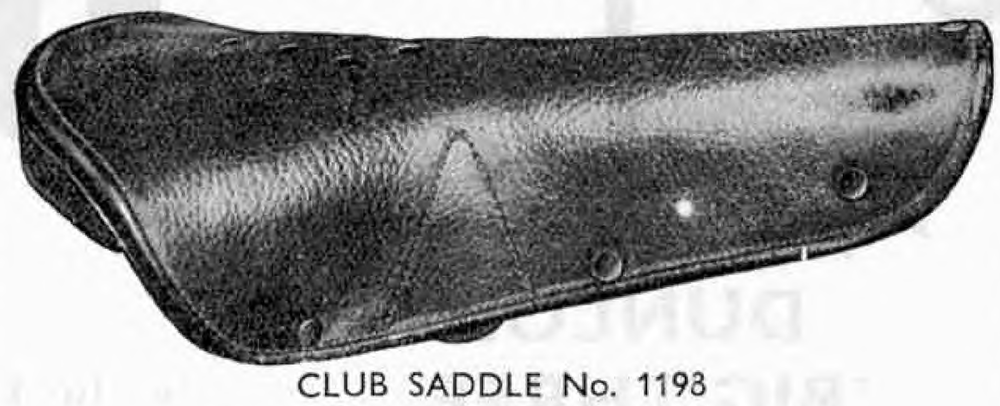
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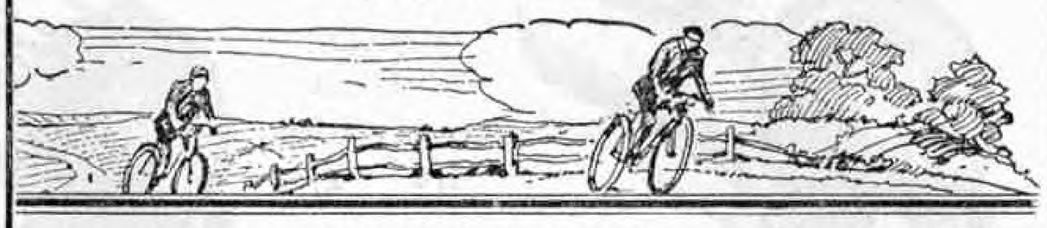
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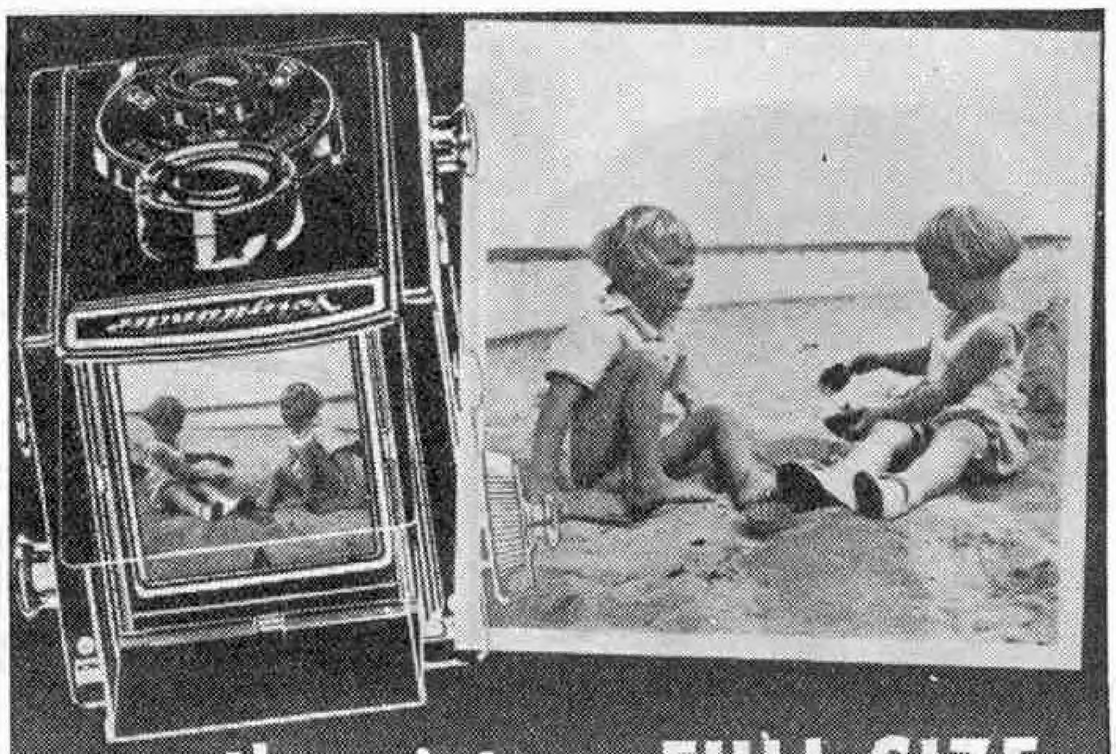
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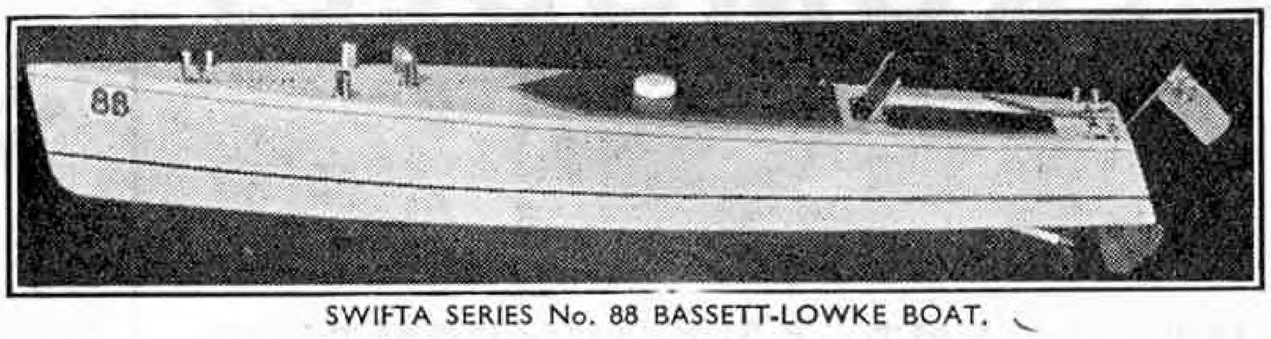
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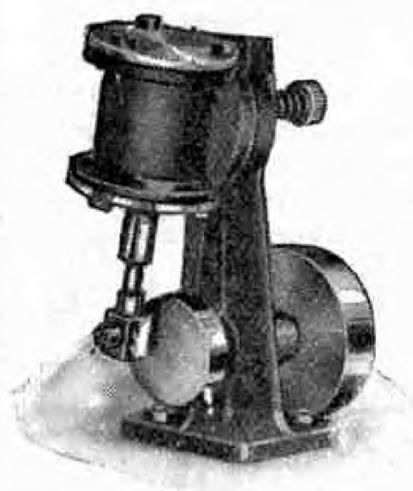
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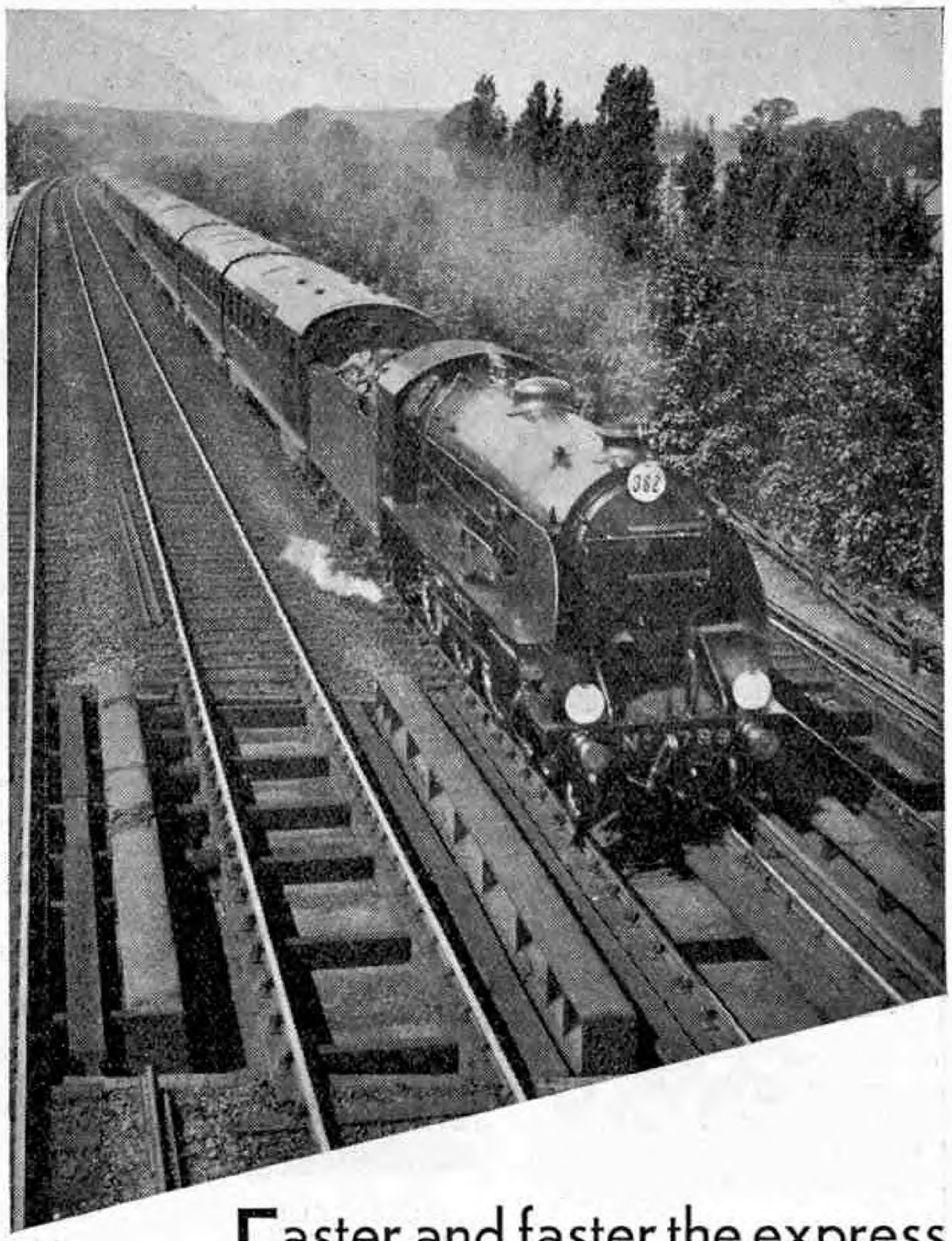
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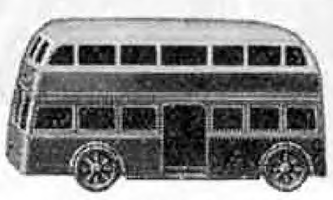
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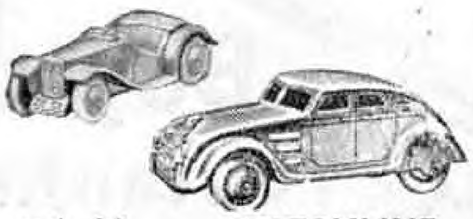
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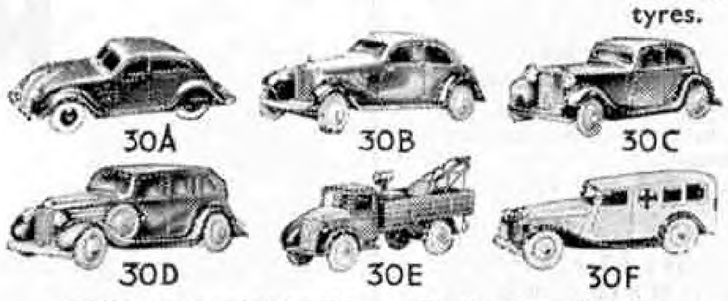
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If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS	
M2930 Locomotive	1/–
MO Locomotive...	1/4
M1/2 Locomotive	2/3
*George V Locomotive ...	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
LEC 1 Locomotive (Swiss Type)	5/3
Zulu Tank Locomotive... ...	6/3
No. 1 Tank Locomotive ...	6/3
No. 1 Locomotive	6/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 1 Special Locomotive ...	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Locomotive	10/–
No. 2 Tank Locomotive ...	10/6
No. 2 Special Tank Locomotive	10/6
Metropolitan C Locomotive ...	10/6
No. 2 Special Locomotive ...	11/3
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	11/9
No. 3C Locomotive	12/–
No. 3C Riviera "Blue" Locomotive	12/–

These models were identical.

ELECTRIC MODELS	
EM16 or EM120 Locomotive ...	4/3
No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
EM36 or EM320 Tank Locomotive	8/3
LST M3/20 Tank Loco (20-volt)	8/3
LE 120 Locomotive	10/–
LE1/20 Loco (Swiss Type) 20-volt	10/–
E06 or E020 Locomotive ...	11/–
E16 or E120 Locomotive ...	12/–
E16 or E120 Tank Locomotive	12/–
LST 1/20 Tank Locomotive (20-volt)	12/–
LST 2/20 Tank Locomotive ...	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive ...	12/6
EPM16 Special Tank Locomotive	13/9
Metropolitan L.V. Locomotive	15/–
E26 Special Tank Locomotive ...	15/–
E36 Metropolitan Locomotive...	15/–
E120 Special Locomotive (automatic reverse)	15/–
No. 2 Electric Tank Locomotive	15/–
E120 Special Tank Locomotive (automatic reverse)	15/–
E36 Locomotive	16/3
E36 Riviera "Blue" Locomotive	16/3
E220 Special Tank Locomotive (automatic reverse)	16/3
LE2/20 Locomotive	16/6
LE220 Locomotive (automatic reverse)	16/6
E320 Locomotive (automatic reverse)	17/6
E320 Riviera Locomotive (automatic reverse)	17/6
E220 Special Locomotive (automatic reverse)	18/9
Metropolitan H.V. Locomotive	18/9

HORNBY TRAINS

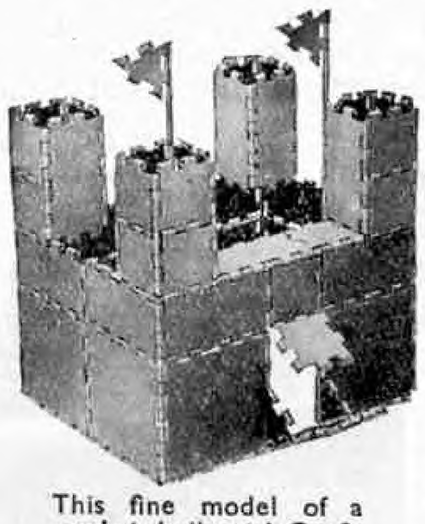
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No. O Dinky Builder Outfit.



Motor Van built with No. 1 Dinky Builder Outfit.

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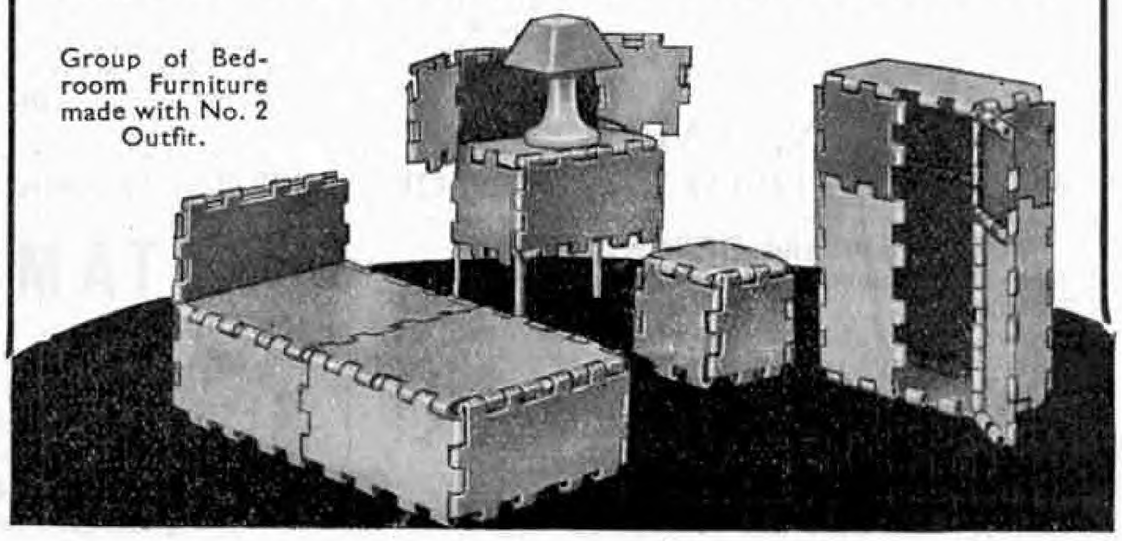
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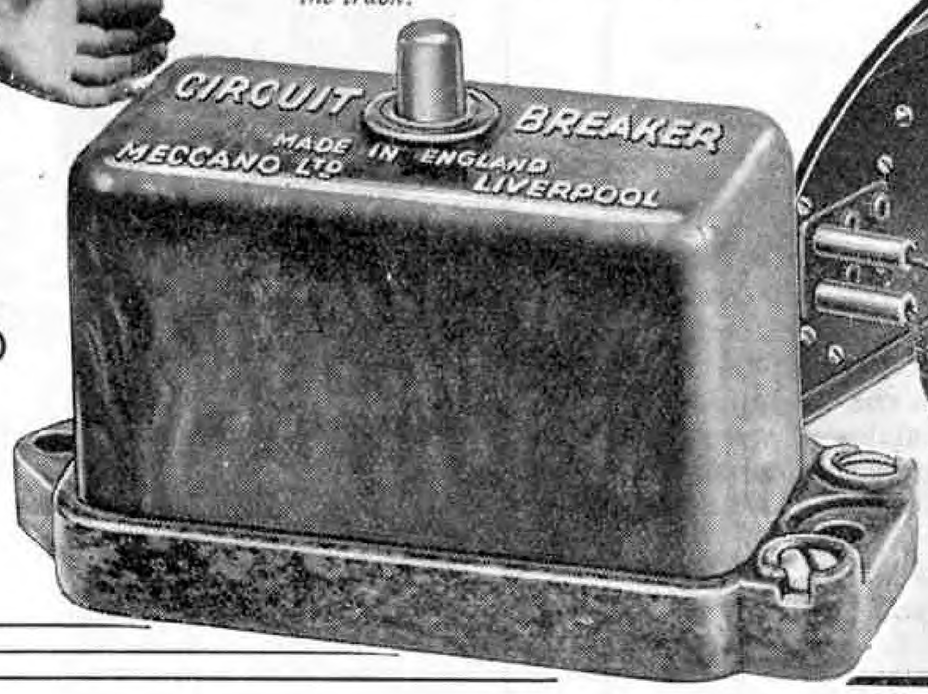
New Hornby Automatic Circuit Breaker

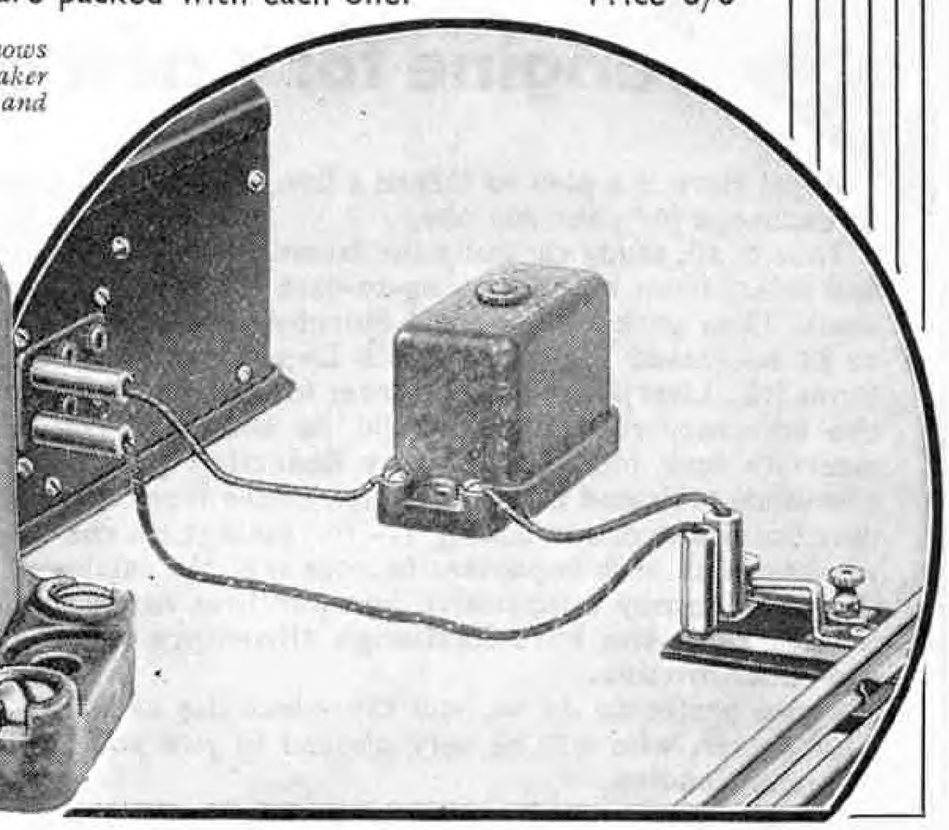
A Device to Replace Fuses

The Hornby Automatic Circuit Breaker is a device which, when used in connection with a Hornby Electric Railway, automatically cuts off the low-voltage current supply if a short circuit occurs. At the same time it draws attention to the situation in two ways—by the rising of a red button and by a sharp click. When the electrical fault that caused the short circuit has been dealt with, and the current switched off at the regulator, the Circuit Breaker is re-set by pressing the button down to its original position. This device does away with the necessity for replacing Fuse Wire whenever a short circuit occurs.

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The illustration on the right shows the manner in which the Circuit Breaker is connected to the Transformer and the track.





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STAMP ADVERTISEMENTS continued from page 304

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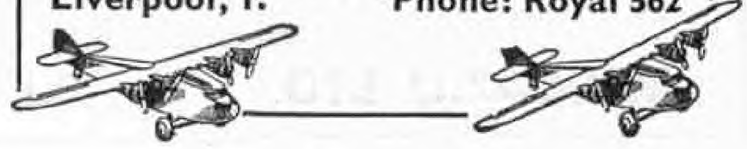
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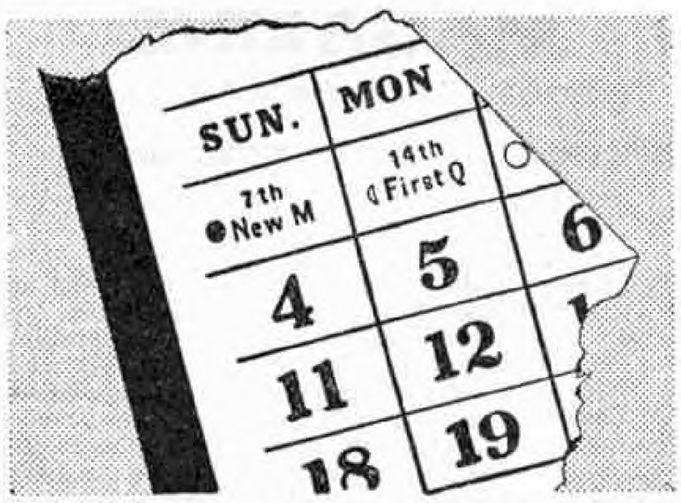
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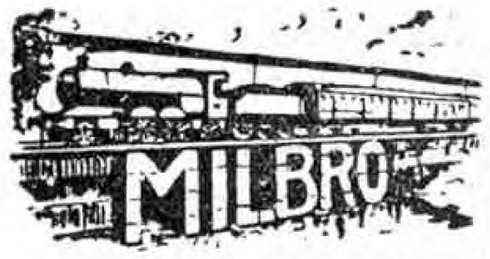
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Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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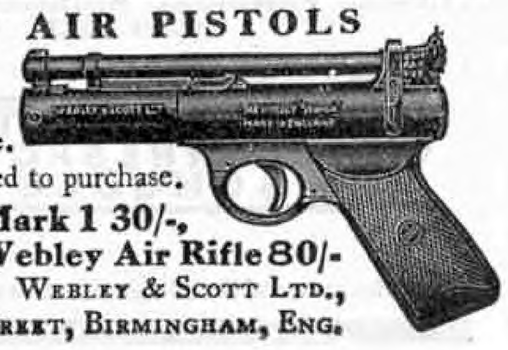
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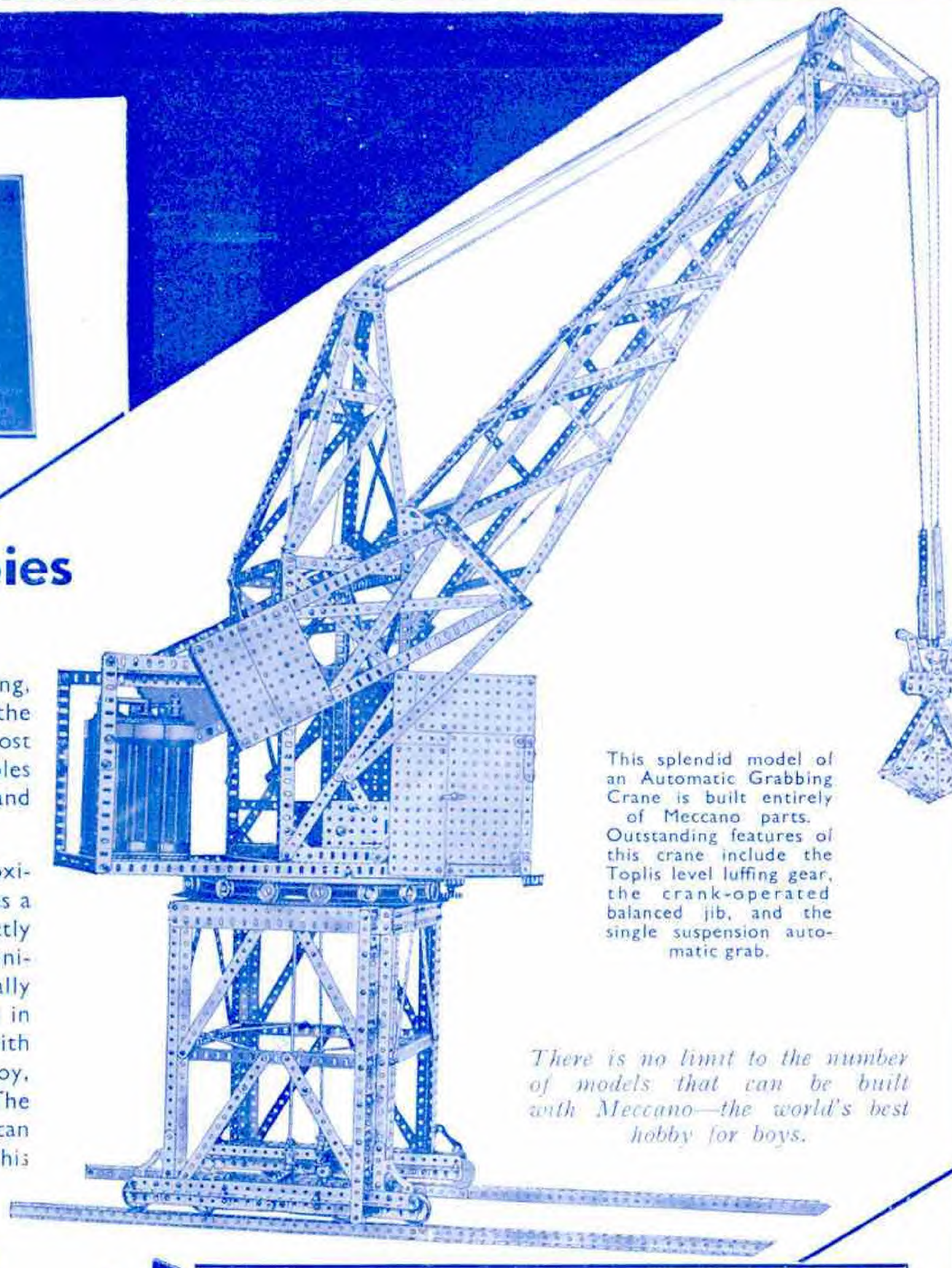


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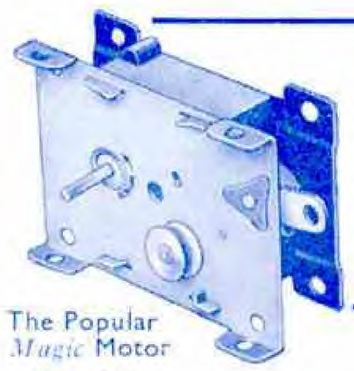
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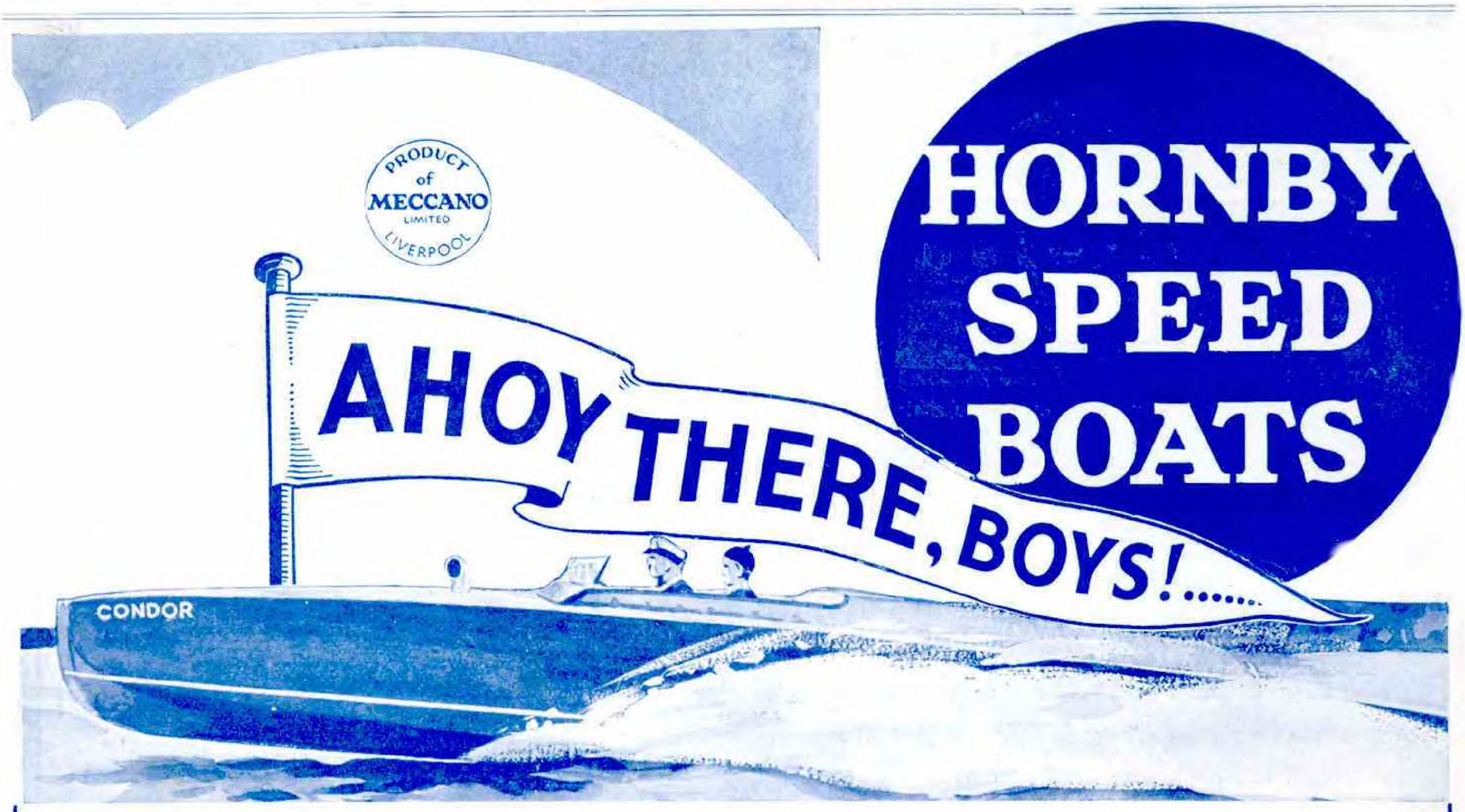
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